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Marine Fisheries REVIEW

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

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Marine Fisheries Review

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U.S. DEPARTMENT OF COMMERCE
Frederick B. Dent, Secretary

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
Robert M. White, Administrator

National Marine Fisheries Service
Robert W. Schoning, Director

Address correspondence to: Marine Fisheries Review, NMFS Scientific Publications Staff, Room 450, 1107 N.E. 45th St., Seattle, WA 98105.

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Editor: Thomas A. Manar

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MFR PAPER 1001

The Future of the Fisheries
I. The Seattle Conference

The status and future of the United States' marine fisheries programs figured prominently in three of the six principal sessions at "The Oceans and National Economic Development," a conference sponsored by the U.S. Department of Commerce's National Oceanic and Atmospheric Administration in Seattle, Washington on July 17-19, 1973.

Designed to lay the groundwork for NOAA and other government agencies to chart the U.S. oceanographic effort between now and the year 2000 A.D., the conference drew more than 600 persons, including the leaders of such diverse marine interests as labor, industry, government, conservation, recreation, commercial fishing, science, and sea transportation. Sessions included: (1) The Ocean's Energy and Mineral Resources; (2) The Ocean's Living Resources; (3) The Oceans as a Recreational Resource; (4) Coastal Zone Management and Marine Resource Development; (5) Regional Organizations and Economic Development of Marine Resources; and (6) Marine Transportation's Role in Meeting Energy Needs.

CONFERENCE GOALS

Conference goals, as outlined by NOAA Administrator Dr. Robert M. White, were "a complete assessment of our oceanic efforts" so that the conferees could gain a "better understanding of the different roles and responsibilities of government, industry and others—and how to go about moving ahead in exercising those roles and responsibilities." In return, Dr. White sought "a clearer understanding of (the conferees') opinions about our national ocean priorities, and perhaps of the way to go about achieving them." Dr. White's remarks are printed beginning on page 7 of this MFR number.

First morning speakers, Sen. Warren G. Magnuson, Dr. Athelstan Spilhaus, and Mr. John Hussey, of the Senate Commerce Committee's Subcommittee on Oceans and Atmosphere (substituting for Sen. Ernest F. Hollings) critically touched upon the decline in U.S. marine fisheries and fishing and suggested ways and means of bringing this industry back to prominence. The afternoon session on "The Ocean's Energy and Mineral Resources," included an assessment of national needs and the prospects of obtaining or fulfilling a sizeable portion of those needs from marine or undersea deposits.

Marine fisheries were emphasized in second-day sessions on "The Ocean's Living Resources," and "The Oceans as a Recreational Resource." The conference format called for each session (except Coastal Zone Management) to have two or three 20-minute presentations, followed by a panel in which participants gave 10-minute talks. The floor was opened for brief discussion following each panel.

LIVING RESOURCES

Chairing the Living Resources session was Mr. Thomas Fulham, President of Suffolk University of Boston and Vice President of the Boston Fish Market Corporation. Mr. David Wallace, NOAA Associate Administrator for Marine Resources, presented "National Fisheries Policies and Programs for our National Needs,"

EDITOR'S NOTE

On July 17-19, 1973, the U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA) was among the sponsors of a conference in Seattle on "The Oceans and National Economic Development."

Attending the conference were 600 Government officials, industry leaders, environmentalists, scientists, and others.

The first several pages of this number of Marine Fisheries Review are devoted to that conference. The first article sets the stage by briefly describing the meeting and its sessions. The second article is by Under Secretary of Commerce John K. Tabor ("The Oceans and Industry"), substituting for Secretary Frederick B. Dent, who could not be present. The third article is by Dr. Robert M. White, Administrator, NOAA ("Sounding Our Ocean Future"). Secretary Tabor's and Dr. White's papers deal with the fisheries in the context of other potentialities and usages of the oceans; since the fishing community is but one segment of a broad group of those interested in the seas, we believe it desirable that the needs and desires of those other groups be noted in Marine Fisheries Review, as they are in these thoughtful papers. The fourth article is by David Wallace, Associate Administrator for Marine Resources, NOAA ("National Fisheries Policies and Programs for Our National Needs") and concentrates specifically and in some detail upon the fisheries. T.A.M.

which begins on page 11 of this number of MFR. Mr. Frank Holas, President of the Booth Fisheries Division of Consolidated Foods Corporation and President of the National Fisheries Institute, gave industry's assessment of Federal fisheries policies and programs and examined the Federal government's role and relationship to an economically vigorous commercial fishing industry. Mr. Harold Lokken, Manager of the Fishing Vessel Owner's Association, Inc., presented the fisherman's view of Federal fisheries policies and programs, with emphasis on the special needs of the fisherman and the fisherman's relationship to the Federal government.

On the Living Resources Panel, Dr. Giulio Pontecorvo, Professor of Economics and Banking at Columbia University, spoke on the federal government's role in economic impediments and incentives. Dr. John S. Dempster, Jr., Vice President of the Zapata Haynie Corporation, provided an insight into the role of science and technology in the revitalization of our fishing industry and Congressman Joel Pritchard commented on the role of present institutions in the protection and advancement of fisheries. Rep. Pritchard also discussed Congressional legislative processes as they applied to marine fisheries problems. Presenting a paper on commercial, recreational and environmental relationships for Mr. Richard Stroud, Executive Vice President of the Sport Fishing Institute, was Mr. Frank Moss, Editor of *Sportfishing* magazine.

A RECREATIONAL RESOURCE

Chairing the afternoon session on "The Oceans as a Recreational Resource" was Congressman Thomas N. Downing. Leadoff speakers were Dr. James G. Watt, Director, Bureau of Outdoor Recreation, Department of Interior, and Mr. Raymond Sherwin, Past President of the Sierra Club. Dr. Watt spoke on preserving the ocean's recreational and social values for present and future generations, while Mr. Sherwin assessed guidelines for shaping new marine recreation programs.

Marine recreation panelists included Mr. Howard F. Larson, Vice President of the Outboard Marine Corporation, Dr. Niels Rorholm, Professor of Resource Economics at the University of Rhode Island, Mr. Robert L. Jones of Jones and Stokes Associates, an environmental consulting firm, and Mr. G. Ray Arnett, Director of the California Department of Fish and Game. Respectively, they addressed themselves to the economic, scientific and technological, social and environmental, and institutional aspects of marine recreation.

Banquet speaker was the Honorable John K. Tabor, Undersecretary of Commerce. His talk, "The Oceans and Industry," begins on page 2 of this number of MFR.

COASTAL ZONE MANAGEMENT

Marine fisheries resources also figured prominently in the final day's sessions on "Coastal Zone Management and Marine Resources Development," chaired by the Honorable Howard W. Pollock, NOAA's Deputy Administrator, and "Regional Organizations and Economic Development of Marine Resources," chaired by the Honorable Betsy Ancker-Johnson, Assistant Secretary of Commerce.

Dr. Beatrice Willard, member of the President's Council on Environmental Quality, addressed the initial gathering on coastal zone management as a key to national ocean resource development. Dr. Allen V. Kneese, Director, Quality of the Environment Program of Resources for the Future, presented a paper on dealing with the establishment of a scientific, technical, and economic basis for coastal zone management decisions. The Federal perspective on coastal zone management was given by Mr. Robert W. Knecht, Acting Director, Office of Coastal Environment, NOAA.

REGIONAL ORGANIZATIONS FOR MARINE DEVELOPMENT

In the session on regional organizations, Rear Admiral Joseph J. McClelland of the U.S. Coast Guard and Chairman of the SEA USE Council, explained the regional marine science organization of the SEA USE Council in the Northeast Pacific Ocean area, citing the potential of such groups in future marine resource development. Dr. Edward Wenk, Professor of Engineering and Public Affairs at the University of Washington, Seattle, discussed the need and value of regional approaches to economic development of marine resources.

The Regional Organization Panel was led off by Mr. D. E. Skinner, President of the Seattle-King County Economic Development Council, speaking on the economic advantages of utilizing such regional organizations in the development of marine resources. An assessment of the regional approach from the federal, state and local government standpoints was made by Dr. William J. Hargis, Jr., Chairman of the University of Virginia's Department of Marine Science. Dr. Robert W. Stewart, Director, Pacific Region of Canada's Marine Sciences Directorate, provided a Canadian view of regional oceanography.

Luncheon speaker on the final conference day was Sen. Ted Stevens, who spoke on the national policies and programs for fisheries management and tasks related to land use management and seabed resources.

The final session, "Marine Transportation's Role in Meeting Energy Needs" dealt with industry, labor and Federal assessments of marine energy transportation problems and programs, and environmental factors, innovations, systems, and ships relating to existing and proposed energy transport programs. W.L.H.

The Future of the Fisheries
II. The Oceans and Industry

JOHN K. TABOR

It is a great pleasure to be with you in this magnificent city of Seattle and this wonderful state of Washington tonight. Certainly there is no more fitting place to hold this conference than the home state of the distinguished Senator Warren Magnuson.

Senator Magnuson has fathered more ocean-related legislation than any man in the history of the Congress, and we all owe him a deep debt of gratitude for his vigorous leadership. It is logical, of course, that he be in the forefront of the nation's ocean effort, since his state is truly an ocean state, whose economy and attractiveness are so dependent on the wise use of the oceans.

As the conference program indicates, Secretary of Commerce Fred Dent was scheduled to be your speaker tonight. I know he was looking forward to participating in this examination of the nation's ocean program. But a last minute change in the schedule of a Presidential mission required his presence in Japan. He is there today with Secretary of State Rogers. Please let me express Secretary Dent's regrets at not being with us.

His absence, however, gives me an opportunity to share a few thoughts with you on the subject of this conference—the ocean, its problems and possibilities.

Each of us, of course, views the subject a little differently; the scientist, the businessman, the economist each sees it from his particular vantage point. My own view, as Under Secretary of Commerce, stems from a basic realization that the whole framework of international relations—military, political, and economic—is shifting from a post-World War II arrangement among nations to a new kind of arrangement, one dominated by commerce. As President Nixon has pointed out, the emphasis is shifting from the political and military to the economic. And he has recognized this basic shift by his far-sighted policies for new initiatives in our relations with other countries.

I want to focus on four basic facts in these changed conditions:

1. This country is in a race, a worldwide economic race. It is the swiftest, the most competitive economic race in our entire 200-year history, and one that is crucial to the material well being of every American, now and perhaps for generations to come.
2. Today, we see some indicators that make us wonder whether we are falling behind in this race.
3. The vast resources of the ocean, and especially those that lie on and under our continental shelf, hold great potential for strengthening our chance of winning that race.
4. We in government, industry, and the scientific community must strengthen our cooperative efforts to develop those resources, while at the same time protecting the precious environment that is the source and sustenance of life itself.

Before discussing this challenge, let me first say that nowhere could it be more fittingly posed. Assembled in this room is the leadership of the nation's ocean effort. You represent industries

John K. Tabor is Under Secretary of Commerce, U.S. Department of Commerce.

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active in ocean affairs, the scientific community, and other nongovernmental groups; and you are the leaders in the congressional and executive branches of government which formulate policies for our ocean program. Together, you are as knowledgeable about this subject as any group that could possibly be assembled. And if we are to realize the potential of the oceans to provide for our national needs, it is *you* individually and in concert—not someone else, not some other group—who are going to lead the effort to achieve this goal.

But you are not only knowledgeable about the oceans. As individual citizens or as businessmen—especially as *taxpaying* citizens or businessmen—you know we face this challenge at a time when government spending of every description must undergo searching scrutiny. Our challenge, therefore, is to bring order and drive and direction to the nation's oceanic effort within the constraints of a tight Federal budget.

This does not mean that our ocean goal has a lower priority. It does mean that each of us must be more innovative and pour more energy, determination and effectiveness into our efforts—and I've never known the time when the American character was ever short of these qualities.

Now let's look for a moment at this worldwide economic race.

During most of the quarter of a century since World War II, the United States has towered over every other nation in the world, economically as well as diplomatically and militarily.

Tabor

Even before that, even before the turn of the 20th Century, we were a vigorous young giant, challenging the undisputed leader of the world. In those days, that was Great Britain. But as long ago as the 1890's, we passed Britain in steel production, and in the early 1900's, our electrical industry became the world leader.

Immediately after World War II, with the economics of the other industrial nations in ruins, we led in just about everything. But beginning in 1946, Japan and the nations of Europe began a gigantic rebuilding program. We helped, with money and materials, in the interest of developing a prosperous, stable world order.

Today, these other nations, some of which are blessed by domestic and international policies minimizing their requirements for defense budgets, are giants of production and financial might in their own right. You can imagine what we could do with the nearly $80 billion we spend on defense.

So our policies of postwar assistance have indeed borne fruit. The world as a whole is enjoying a prosperity undreamed of a quarter of a century ago.

". . . we in the United States face a new challenge . . ."

But today, we in the United States face a new challenge. We are no longer the only economic superpower in the world. Just as we challenged Britain in the 1880's, so our leadership is being challenged today.

How many Americans realize today that *we* have now been surpassed in steel production—by the Soviet Union? And that some observers predict that by 1975, Japan will pass both us and the Soviets in this key indicator of economic strength? Already the biggest steel producing firm in the world is not an American company, but Japanese.

And in western Europe, the enlarged Common Market has become an economic unit that rivals the United States in size, population, and productive capacity.

Today, through trade and investment, all the great economic superpowers are drawing closer together in an integrated world economy. Our new trading arrangements with the Soviet Union and the People's Republic of China are just one indication of this movement. And I would point out that the shift among nations to economic competition has resulted from the remarkable diplomatic achievements of President Nixon. Instead of an unrestricted armaments race, we are back to rational competition in goods and services and productivity—a battle we ought to win.

". . . we are back to rational competition in goods and services and productivity . . ."

If we are to remain the leader, we must maintain our competitive ability in this new and more challenging era of a one-world economy. We must have a sustained increase in productivity. We must keep our scientific and technological lead. We must control inflation in order not to price ourselves out of the world market. We must maintain the highest standards of quality production, and we must provide unexcelled service. We are literally facing a worldwide challenge, such as never before in history.

Now what about basic material resources, and particularly the contribution the ocean can make, in this new era of world competition? Where do they fit in?

We know only too well that the competition for such critical supplies has taken a quantum leap in just the past five years. The rapid spread of industrialization throughout the world is putting more and more pressure on energy and mineral resources of all kinds. And growing world affluence is bidding the prices higher and higher, creating scarcities and disrupting markets everywhere.

In an advanced industrial society such as our own, these resources are even more crucial. We are the world's leading users of energy resources of all kinds, of mineral ores, and of high-protein food resources.

As for the oceans, we know that they can supply us with a substantial

portion of our needs in these areas. But we are hardly the only nation aware of this. All countries know it. We all know that the technology to tap the ocean's treasures is either in hand or on the horizon. And many nations are moving to exploit these resources to the fullest.

". . . protein is the touchstone of a healthy human society . . ."

Now let me emphasize that it is the firm position of the United States that this competition should not be allowed to result in a destructive race to acquire these resources. President Nixon has clearly enunciated his oceans policy which is based on the concept that we must arrive at some international agreement for dealing with world ocean problems.

For this reason the United States has urged and supported the new Law of the Sea Conference under the United Nations, which will commence this fall in New York. This conference will focus on problems of control over global fisheries resources, on deep-sea exploration and utilization, and on preservation of the marine environment. However, even a successful outcome of these deliberations will leave us with the normal competitive drives for access to the ocean's resources.

So let's see how this competition is shaping up in two of the "gut" areas—energy and protein. Energy provides the drive for the world's industrial machine, and protein is the touchstone of a healthy human society.

". . . there are disquieting signs . . ."

The oceans already provide significant fractions of these basic resources. This is not to say that other materials, such as hard minerals, will not similarly become important. But today, for most mineral resources, we do not confront the immediate crisis we do in the fields of energy and protein.

In the protein, or living resource, area of the ocean's treasures, there are disquieting signs. The concept of limitless fish resources, which induced many nations to increase their fishing fleets enormously, has been proven a myth. We are now fishing many species at maximum capacity, and we are beginning to impinge upon the total limits of ocean productivity.

The world harvest from ocean fisheries is now 70 million metric tons. Many experts believe it cannot much exceed 100 million tons on a sustained basis, a perilous outer boundary that may be reached in about 10 years.

And how are we faring in this part of the race, in getting our share of these valuable resources?

The blunt answer is, we are losing.

The present trade deficit in our fisheries account has reached an astounding $1.3 billion annually.

". . . we import $1.3 billion more of fisheries products . . . than we export . . ."

That means that we import $1.3 billion more of fisheries products into the United States than we export.

And directly off our coasts are some of the richest fishing grounds in the world.

Now what kind of logic is this? It isn't as though we have to travel half way around the globe to find these waters. They're right here in our own backyard.

The only sensible thing to do is make whatever institutional, scientific, and technological changes are required to correct the situation. Or we're going to watch that $1.3 billion fisheries deficit grow to the size of leviathan.

It will help, of course, if we can achieve international control of common fishery resources. And at the Commerce and State Departments we are hard at work helping to prepare for such control through a framework established by the coming Law of the Sea Conference. But in the interim we must press present international fishery bodies to gain our ends.

". . . one aspect of the competition for living resources of the sea lies in . . . mariculture . . ."

Adequate knowledge of stocks upon which these management policies depend is fundamental to this task. In response to such needs we have begun in NOAA a program of monitoring and assessment to obtain more information about the distribution of our fishery resources.

In addition, our technology must be focused on harvesting new and expanding fisheries, particularly for presently underutilized species; on new product development; and on complying with new pollution abatement requirements facing industry.

One aspect of the competition for living resources of the sea lies in the potential of mariculture, the artificial culture of marine organisms. Here in the Puget Sound, we have seen solid progress in the project to bring the mariculture of salmon to commercial viability. This work was originally stimulated and supported by the Commerce Department's National Marine Fisheries Service, and its Sea Grant Program. Domsea, Inc. has now carried this work through to commercial production. I understand you tasted the fruits of this new scientific development at lunch yesterday—and certainly it doesn't seem to have hurt any of you.

We also are working toward development of other pilot mariculture systems for such species as shrimp, the American lobster, oysters, and pompano.

But in mariculture, too, we are competing with other nations of the world. The Japanese and French are moving rapidly in this area, and we will hold our own only if we enlarge on our scientific and technological competence in it.

Let me turn now to the energy situation.

It hardly needs reviewing: You have discussed this in detail; the crisis is headlined daily in every newspaper.

The facts are these:

Today, crude oil and natural gas supply over 75 percent of our total energy requirements.

By 1985, our demand for energy will double over present levels. Our requirements for imported oil may be in excess of 50 percent without substantial new domestic oil developments.

The U.S. Geological Survey estimates that our outer continental shelf may hold 160 billion barrels of recoverable oil, four times our entire proven reserves.

And the Survey estimates that area may contain 800 trillion cubic feet of natural gas, three times our proven reserves.

" . . . we must step up our efforts to tap these vast treasures . . . "

We must step up our efforts to tap these vast treasures without delay. Government's role is to expand the lease rate. President Nixon has recognized this by directing in his energy policy a tripling of the lease rate on the continental shelf. It is up to the private sector to undertake the drilling, and we know it is ready, willing, and able to do the job.

Here, the technology for finding and extracting the oil is in hand. Over 17,000 wells have already been drilled in our offshore areas. And I am confident that industry will move vigorously to take advantage of this new opportunity to extend their operations.

But as energy needs mount, even our expanded domestic production will have to be supplemented by substantial foreign imports. Here too President Nixon has initiated important actions to ensure our capabilities to receive them.

One move involves deep water ports or offshore terminals that can accommodate modern tankers and LNG ships. As you know, we are dealing with foreign flag tankers of up to 300,000 dead-weight tons. Even larger tankers, in the range of 500,000 tons, are now under construction.

But there are few ports in the United States capable of handling such enormous ships. So we are faced with the tough question of where and how we are going to build the necessary terminals for them; of whether the technology is now in hand; and if so, how we finance the development and building of such terminals.

Recognizing the difficulty of the decisions to be made, President Nixon has proposed legislation placing responsibility for licensing and certification of such deep water ports in the hands of the Department of Interior.

In addition, under the President's maritime program, the Congress has authorized the expenditure of $900 million for construction of new tankers and LNG ships since 1971.

Together, these actions represent a giant stride toward assuring our energy needs in the long range future. Much work remains to be done in implementing the policies, but there is no question that President Nixon has set us on the right course.

" . . . we're in the race of our lives . . . "

In the area of hard minerals, which I mentioned as not being a critical problem now, we will eventually need to tap the deep water deposits of these materials also. Development of the technology to mine manganese nodules is already underway. And certainly here too we are in competition with others—the Japanese and the Germans, for example—for development of economic recovery techniques. We dare not be left behind in this area either—or we will live to regret it.

So the challenge is obvious: We're in the race of our lives—and the ocean's resources can help us stay ahead in this race.

How are we to increase our efforts to tap these resources?

Let me first recognize frankly that there is some disappointment here this evening in terms of government commitment for all-out support of some undertakings. And I bring no pledge of vastly increased funding for the nation's ocean program. The most fundamental way to battle inflation remains a responsible budget, fixed in fiscal 1974 at $268 billion. But I do come with the conviction that the dynamics of the situation are such that we cannot avoid a growing and more vigorous effort in this area.

Each of us has a critical role to play.

Government must provide the services that are its traditional job.

It must ensure conditions of law, national and international, that open and preserve the way for private industry to do its job.

And it must support the policies that stimulate the free enterprise system, providing limited government support only where essential.

Within our own Department of Commerce, we have some outstanding examples which illustrate this government role. These include:

- The subsidy program for ship construction of the maritime administration.
- Our efforts in the Law of the Sea negotiations.
- Our assistance in resolving environmental conflicts through NOAA.
- NOAA's mapping and forecasting work to minimize the impact of the forces of nature.
- NOAA's marine advisory services for transferring technology from the laboratory to the people who need it.
- And the development of a growing export market potential for our fishing industry.

Industry's role is to develop and apply the technology, build and operate the fishing fleets, extract the oil,

and mine the manganese nodules. We believe that our private sector has outstanding managerial skills required to organize the human, material, scientific, and capital resources required to get the job done.

The role of science and engineering is to respond to industry's needs with innovative discoveries and techniques that will maintain our leadership in ocean technology.

And we must weld the efforts of all these three segments into a cooperative whole that moves as a single integrated unit toward clearly defined goals that advance our interests.

But we must approach our ocean tasks in the full realization that we must protect our precious environment and conserve the resources within the ocean. For if the oceans are to sustain us with renewable living resources, if they are to sustain a growing interest in marine recreation, and if we are to discharge our duties to ourselves as citizens, then we must insure a quality environment.

Today, our wetlands, and the irreplaceable fish and wildlife resources they support, are endangered by growing industrialization.

Our highly productive estuaries are being damaged by the run-off of pesticides and fertilizers needed to maintain high farm productivity.

And there are those who fear further pollution of the oceans through additional offshore drilling operations.

All of which adds up to an ocean management problem composed of new and complex dilemmas. And their resolution is another task for science and technology, which must devise ways and safeguards that enable us to meet our needs for quality as well as quantity.

So all of us here this evening will be tested. And it is not too much to say that the course of the future history of this nation may be riding on how well we meet this test.

Do we have the skills, the innovative ability, the determination, that enable us to meet the competition in developing the ocean's resources?

Do we have the capacity for cooperation that can multiply tenfold the strength of our individual efforts?

Above all, do we have the competitive spirit that will make us winners?

You may remember President Nixon speaking about this competitive spirit in announcing his new economic policy in August 1971. He said, and I quote, "A nation, like a person, has to have a certain inner drive in order to succeed. In economic affairs that inner drive is called the competitive spirit.

"Whether this nation stays number one in the world's economy, or resigns itself to second, third, or fourth place; whether we as a people have faith in ourselves, or lose that faith; whether we hold fast to the strength that makes peace and freedom possible in this world, or lose our grip—all that depends on you, on your competitive spirit, your sense of personal destiny, your pride in your country and in yourself."

This message, I think, has a special relevance for every one of us in this room. And if I'm any judge of the American character, that spirit is alive and well and kicking among the people leading our country's effort to tap the vast treasures of the ocean.

The Future of the Fisheries III. Sounding Our Ocean Future

ROBERT M. WHITE

I am pleased to be with you today, and not only because of the magnificence of Seattle and the warm hospitality one always encounters here. We have a great deal to do, and I cannot imagine a finer place in which to set about it.

First, however, I should like to express appreciation to the many organizations and persons, here and elsewhere, whose effort has helped bring this conference to reality.

Robert M. White is the Administrator of the National Oceanic and Atmospheric Administration.

We have assembled many of the nation's oceanic leaders—in government, industry, and the environmental and academic communities, to exchange candidly their views on the way America should go in the oceans. It is my hope that three days from now, we in Government will have a clearer understanding of your opinions about our national ocean priorities, and perhaps of the way to go about achieving them.

For industry, we hope new opportunities will be identified. The week will also afford the opportunity for those dedicated to the preservation of the quality of the ocean environment to express their views. We hope, too, that ocean scientists of all disciplines will find new ways to contribute their talents to meeting national needs.

White

I hope all of us will leave Seattle with a better understanding of the different roles and responsibilities of government, industry and others—and how to go about moving ahead in exercising those roles and responsibilities.

In some respects this gathering may be considered as a kind of stocktaking.

Five years ago, a congressionally-mandated Presidential commission published its landmark report, "Our Nation and The Sea."

The commission offered recommendations on all facets of our national ocean needs—marine science and technology, manpower, management of the coastal zone, living and non-living resources, environmental protection, global environmental monitoring and prediction.

Since that report there have been numerous ocean conferences, but there has not been a comprehensive assessment of our oceanic efforts. This is a time for such an assessment.

Many recommendations of the commission have been implemented fully, others have been carried out in varying degree, others deferred or dropped. Almost all recommendations involving environmental pollution, for example, have been acted upon. Under President Nixon, we have seen the emergence of the Water Pollution Control Act, the Ocean Dumping Act, the signing of an International Treaty on Ocean Dumping, and the creation of the Environmental Protection Agency and the Council on Environmental Quality. Similarly, those recommendations relating to the law of the sea—dealing with fisheries, seabed resources, freedom of navigation, and scientific research—have had a significant impact on the U.S. position at the preparatory meetings.

The Commission's principal organizational recommendations have been adopted with the President's establishment of the National Oceanic and Atmospheric Administration and the National Advisory Committee on the Oceans and Atmosphere. Now the President, as we all know, has proposed establishment of a Department of Energy and Natural Resources as a part of his program to deal with the nation's energy and natural resource problems and opportunities. He proposes that NOAA be transferred to this new department. This is a vital step in the evolution of our organizational mechanisms to deal with our ocean environment, and one which deserves the support of all citizens. The Commission's recommendations with respect to the management of the coastal zone have become law under the Magnuson Coastal Zone Management Act. Largely through the efforts of NOAA's Sea Grant Office, many functions of the coastal zone laboratories proposed by the Commission have come to life. Aquaculture is being studied on a broad and coordinated front, and a National Marine Advisory Service is being developed.

The Commission recommended the rapid development of our seabed oil and gas resources. President Nixon's recent energy message has indicated that the United States will triple its rate of offshore leasing for oil and gas.

The Commission's advice concerning an environmental monitoring and prediction system is on the road to reality. Ocean data buoys are under development. Sophisticated satellite systems are operating. Communications have improved. Tsunami warning efforts have intensified. NOAA has in place a marine weather service for those who use the seas.

The Commission's recommendations for intensified ocean research and for improved collaborative efforts with other nations are being carried through. The International Decade of Ocean Exploration, under sponsorship of the National Science Foundation, is producing the kind of major research programs urged by the Commission—for example, the Mid-Ocean Dynamics Experiment, its Upwelling Experiment, and others. We are seeing the beginnings of a University-National Oceans Laboratory System.

We are reaching out to other countries in new, exciting, joint programs. We are collaborating on a bilateral basis with the Japanese, the Canadians, and the French. With the French, this year, we have commenced the pioneering underwater exploration of the Mid-Atlantic Ridge. And only a few weeks ago in Washington an agreement was signed between the U.S. and the USSR to pursue oceanic goals. Only good can come of agreements like these.

On balance, we see significant progress.

". . . there is a restlessness in the oceanographic community . . ."

And yet, there is a restlessness in the oceanographic community, a feeling, perhaps, that we have not pushed hard enough or fast enough. There is no denying that a tight rein has been held on Federal spending as a matter of national fiscal policy, and that many programs have been affected. The Congress has concurred in the need for maintaining a spending ceiling on total Federal expenditures, as a key element of the national effort to provide a vigorous non-inflationary economy.

Our planning, however, should not be constrained by the present state of our pocketbook. We must continue to formulate and innovate and press for what we believe to be a desirable Federal program. But we must realize that we are planning programs that must compete for Federal investment with other proposed government efforts. If we produce a program the nation needs, and make clear that need, I am convinced that we shall obtain support. We must ask what government should and should not do in support of ocean programs. Increasingly, government applies much the same kinds of criteria as industry in deciding whether to invest in particular effort. For example, industry evaluates the market: government, the national need. Industry relates proposals to corporate objectives; government, to national policies and goals. Both consider the risk of failure: both establish overall program cost. Both determine the availability of capital and other resources. Industry measures return on investment in terms of profits: government, in terms of national well-being as well as an expanded tax base.

In the next three days we will be

thinking about energy, raw materials, fisheries, recreation, the coastal zone and marine transportation—the last in particular reference to its role in meeting the nation's growing and urgent energy needs. Each is a matter of broad, critical, national importance. To a greater or lesser extent the ocean and its resources play a role in fulfilling these needs. In some cases, it offers the only solution.

It is our hope that this meeting will sharpen our estimates of the scope, importance, and urgency of ocean resources in fulfilling these needs. In turn, this should lead to specific descriptions of what needs to be done, how, when and by whom—government or industry or both.

". . . certain things have to be done. . ."

Certain things have to be done. Now is a time to sort them out. There are critical national requirements that only the ocean can fulfill. The transport of oil and gas from overseas is an obvious current example. If we are to reduce our dependence on foreign fish and fish products, we must either consume less fish—and that may include eating less chicken as well—or we must sharply increase the catch of our own commercial fishermen. Ocean recreation, an increasingly popular pastime, can only be had if we preserve access to the ocean and a quality ocean environment.

There are critical national requirements in the fulfillment of which ocean resources may prove the best of *several* alternatives. The offshore siting of nuclear power plants and deep-water ports are current examples. The potential yield of copper and nickel by deep-ocean nodules is another. Offshore production of oil and gas is, of course, an obvious instance.

One of our most vital responsibilities here, it seems to me, will be to draw clearly and precisely the lines of dependence between national, industrial, and human problems and the potential of ocean resources for helping to solve them. I happen to believe a major Federal investment in ocean programs is not only desirable but necessary—but if we cannot make our case, the time for the oceans is not yet here. And this I cannot believe.

We cannot run the risk of talking in abstractions. We must describe our world in the terms used by the decision-makers. We must relate our efforts to the solution of the problems which command their attention. We must do so realizing that ocean solutions to national problems are by no means the only solutions being advanced. We have a great opportunity here this week to think and talk in those terms.

Let me attempt to do this in one novel way. Has anybody ever looked at something we might call the ocean balance of payments as one way to keep score on how we are doing? Such a concept has its deficiencies, but it is at least an intriguing way to demonstrate our dependence upon the oceans in quantitative terms. It also offers a way of expressing the importance of the oceans in terms which we can hope will speak to those we must convince.

As you know the Commerce Department constitutes, among other things, an impressive resource of statistics on virtually every aspect of the national economy. I have turned to our Bureau of Competitive Assessment and Business Policy for an estimate of the total 1972 factors contributing to what we might call an ocean balance of payments value. This figure includes not only the balance from existing trade in ocean products and services, but also in certain commodities where ocean resources—were they exploited, which they are not now—could provide important relief.

In developing these figures, we discovered that traditional Federal statistical reporting and analysis techniques are not always ocean-oriented. An analytical purist might consider the ocean balance of payments figure a kind of statistical bouillabaisse, but it will serve to make the point.

To put this figure in perspective, I must remind you that the *total* U.S. balance of payments deficit in calendar year 1972 was $10.3 billion. Our adverse balance of *trade* alone was $6.9 billion.

"Ocean Balance of Payments, 1972"

Item	$million
Petroleum, both crude and refined products	*—4,000*
Natural gas	*— 400*
Fish and fish products	*—1,300*
Ocean freight charges	*—1,200*
Americans traveling from U.S. ports on foreign cruise ships	*— 263*
Raw materials we would expect to get from mining manganese nodules	*—1,074*

It is abundantly clear that with our rising dependence upon foreign sources of raw materials and fuels, we should seek as a matter of general national policy to reduce this adverse balance. We have seen the economic effects of this drain.

The numbers I have been able to assemble indicate that the U.S. "ocean balance of payments" deficit for 1972 was more than $8 billion. I doubt further study would prove it smaller, but I should not be surprised if it were larger.

Let us examine some of the more significant elements of this total. The largest single deficit account is petroleum—both crude and refined products—with an adverse balance of slightly over $4 billion. In view of the present energy crisis and the higher prices being charged for foreign oil, it will be even larger for 1973. As for the 1980's—the estimates are staggering.

The adverse balance for natural gas in 1972 was $400 million; by 1980 this total may rise as high as $4 billion, depending upon the quantity of liquefied natural gas we import and the price we pay for it.

You may be shocked to find that the 1972 adverse balance in fish and fish products was $1.3 billion—up 43 percent over 1971 and up *318* percent over 1960. We have no hard figures on the balance in fishing gear, marine electronics and the like, but you may be sure it is substantial.

Here are some other figures:

- For ocean freight charges, an adverse balance of approximately $1.2 billion.
- For Americans traveling from U.S. ports on foreign cruise ships, approximately $263 million.
- For those raw materials we would expect to get from mining manganese nodules on the ocean floor—their copper, nickel, cobalt, and other content—the 1972 adverse balance was some $1,074 million.

I am not suggesting that the solution to all our raw materials and balance of payments problems resides in the oceans. Clearly, in the case of oil, U.S. offshore production cannot be increased to wipe out the deficit—even if it were desirable, which it may not be. However, when roadblocks to expanded production are removed, which President Nixon has ordered done, we will ease substantially the dollar drain from this source.

The balance of payments, of course, cannot be the only consideration in adopting a policy aimed at the substitution of deep-sea resources for imports. Our national decisions must consider the impact of reduced buying on the economics of developing countries, balancing the interests and rights of the whole international community in the resources beneath the non-sovereign high seas.

But let us not lose sight of the fact—that our adverse balance of payments in ocean and potential ocean products and services is a number almost equal to the *total* U.S. balance of payments deficit, and it is growing in many important areas.

". . . the oceans . . . are a source of excitement . . ."

The oceans are more than an economic entity: they are a source of excitement which, we should hope, will continue to be contagious. The ocean, like the enchanted forest of old, is an unending source of wonder and mystery, and sometimes of mysteries revealed.

Nowhere is this more evident than in some of the discoveries that have derived from basic oceanographic research, and in what these discoveries may mean to us in our search for adequate supplies of energy and raw materials to fuel our future.

Within the decade, marine geological research into plate tectonics and seafloor spreading have revolutionized man's view of his planet—of how oceans and continents form—and of why volcanoes and earthquakes occur where they do. From the pragmatic viewpoint, this "pure scientific research" has provided a more productive insight of where to look for oil and other resources by illuminating, finally, just how these deposits were formed in the first place.

And now this same line of research is beginning to show us the conditions under which many of the hard-rock ore deposits on which we have so long relied ashore are formed. Knowing what we now do about the whole field of plate tectonics, and by tracing the source of such events back through geologic time, we may soon be better able to discover new deposits ashore.

Just as exciting as these discoveries is the challenge posed by the development of the techniques and technologies for their economic recovery. The prospect of competitive hardrock mining under the seafloor thousands of feet below the earth's surface appears today as difficult of achievement as the prospect of man walking on the moon seemed 20 years ago. But man has walked on the moon. One day, it seems reasonable to believe, we shall be doing things underwater which today seem incredible.

There are a great many ways to look at the oceans—and we should look at them all. They are a magnificent resource; they are also a fragile one which cannot indefinitely be abused, and which must carefully be preserved for the future.

The oceans are also an environment in whose quality we all have a stake. They are not only a place of resources, they are a place of enjoyment and beauty. Our ability to continue to harvest their resources depends upon the maintenance of this quality, as does our ability to foster growing recreational activity. Economic development and a quality environment can—and must—go hand in hand.

Our oceans are in truth a frontier. We are keenly aware of what we need and want from them. We are not wholly clear, perhaps, on where the responsibilities of government and others begin and end.

This week, if we can attain a clearer vision not only of what we want but how to get it, we shall have done ourselves and our nation a service.

The Future of the Fisheries IV. National Fisheries Policies and Programs for Our National Needs

DAVID WALLACE

Perhaps it would be well at the start to summarize briefly a statement of national fisheries policy. You heard yesterday of the severe decline in the stature of our fisheries production among the nations of the world, from first to sixth as of 1971. You heard of the depletion of stocks off our own coasts, caused by increasing intrusion of foreign fleets and—we should admit in some cases by our own practices. And that the situation in our fisheries has affected not only those so engaged, but our entire economy as manifest in a substantial contribution to our national trade deficit, with two-thirds of the fish consumed in the U.S. being imported.

Wallace

It can be said in a number of ways —but simply—it is our national policy in this area to maintain the U.S. fisheries as a viable sector of our economic strength. We can argue over this statement but resolution would not be difficult. The hard part is coming to grips with how to go about it, what methods and programs and practices we can undertake to provide the most good for all. I want to make sure that those of you not familiar with the structure of U.S. fishing interests understand this before I go on.

" . . . it is our national policy . . . to maintain the U.S. fisheries as a viable sector of our economic strength . . ."

The fishing industry is not as homogeneous as one might suppose. Commercial and sport fishing interests are often in conflict with respect to solutions to problems such as species taken, areas fished, and resource allocation. Within the commercial sector, solutions seeming to satisfy one segment, say nearshore or coastal fisheries, often inflict severe hardships on distant water fisheries, and so on. Add to these the difficulties of prescribing the management practices of our domestic fishermen while foreign fishermen off our coasts remain relatively immune.

Thus, it is the methods we are employing today to resolve such problems, whose solutions are essential if we are to make headway toward national policy, that I will examine.

As the first speaker on living resources at this conference, I would like to touch upon four points:

1. We must conserve our fisheries resources and insure our fair share for our domestic fishermen.
2. We must preserve our marine waters as a viable habitat for fish and shellfish.
3. We must encourage and support the development of mariculture; and
4. We must foster the growth of our industry and insure quality products at fair prices to the consumer.

Our institutions for management of our fisheries, with a few notable exceptions, have failed to provide a structure for the preservation of resources and encouragement to our private enterprise system. Our management systems suffer from the deficiencies of overlapping jurisdiction, international mechanisms which fail to recognize the realities, and in some cases a total lack of adequate management authority. We need to create systems which will assure simultaneously sustained availability of fish and an encouraging commercial climate. Such systems require cooperation—between our states, between the states and the federal government, between the three marine fisheries compact commissions and the federal government, between the federal government and other nations, and between these government institutions and the industry which must operate within these management systems. Our policies must cope with short-term realities while laying a foundation for longer-term needs.

". . .we are optimistic about the long-term outlook. . ."

Creation of such systems requires wisdom, ingenuity and dedication. Nobody likes the restraints that fisheries management inevitably brings, but the alternatives are worse—gradual destruction of our fisheries and a further decline in the industry.

The short term can provide only partial help. But we are optimistic about the long-term outlook. Indeed, as we look back over the developments of the past several decades and forward to the next two, I am led to believe that the fishing industry is undergoing a major

David Wallace is Associate Administrator for Marine Resources of the National Oceanic and Atmospheric Administration.

transition from a bleak period for many segments to one in which all parts can be important, self-sustaining, economically vital forces. Rising world demand for protein foods guarantees this outcome—but only if we manage wisely.

". . .our foremost goal is to secure appropriate national and international control of the common resource. . ."

Let's look at some of the things that we are attempting to do. Our foremost goal is to secure appropriate national and international control of the common resource. As all of you know, our long-range approach is to secure international agreement on the jurisdiction and control over global marine fisheries resources through the United Nations Law of the Sea deliberations which will finally start this year. The position of our government is simple. We seek coastal nation control over coastal species, coupled with a coastal nation preference to the fish, based on that country's capacity to harvest. We seek control by coastal nations of anadromous species and we seek international control over the species that are highly pelagic, such as tuna.

Attainment of these objectives even under the best of circumstances is some years off. What about the interim?

We are moving immediately within our existing authorities to strengthen a State/Federal management program targeted for specific species within the territorial seas and the contiguous zone, and beyond. We have under preparation management programs for the lobster, the surf clam, the Dungeness crab, and other species. Our present authorities do not allow us to do the job fully. As a first step to securing adequate authority for both the State/Federal management program and international management efforts, the administration has submitted the High Seas Fisheries Conservation bill. The President highlighted the importance of this act in his environmental message.

We recognize that not all will agree with every provision of the bill. We hope for the sake of our fisheries and the industry that there will finally emerge a strong act which will permit building rational fisheries management systems.

We must use whatever tools are at hand to move toward the accomplishment of our goals of conservation and a fair share of the resources for our fishermen. Two techniques, which have been in use for some time, are international regional commissions and bilateral agreements. We are taking an increasingly hard line in our international negotiations. An example of the new firm attitude is best demonstrated by our actions in June, 1973 in Copenhagen at the annual meeting of the International Commission for the Northwest Atlantic Fisheries. I would like to use this illustration as I was one of the three U.S. Commissioners.

". . . our opening position in ICNAF was that the total fishing effort had to be reduced . . ."

Some progress has been made over the past two years. But it has been apparent that the steps taken were inadequate to protect and restore the stocks and provide a fair deal for American industry. Our opening position in ICNAF was that the total fishing effort had to be reduced to a point where rapid recovery of the stocks could be anticipated. This proposal was rejected by the Commission, which suggested that it would be willing to consider a reduction using the total quota concept.

The U.S. then proposed a total quota of all species sufficiently low to bring about a reasonably rapid recovery of the stocks and the opportunity for our own fishermen to fish to the full extent of their capability. This position is consistent with the U.S. position on fisheries as already enunciated before the Law of the Sea Preparatory Committee.

Even our second position in ICNAF did not prevail at this meeting. However, I believe the U.S. delegation made the point crystal clear that our concerns are real and we are determined to obtain relief. The fact that the other nations of the Commission are calling a special meeting in October devoted exclusively to seeking ways to meet the U.S. demands for reduced fishing effort indicates that they now recognize our determination to have these problems solved.

"...we must start developing fisheries and markets for latent stocks..."

Our drive to establish wise management programs cannot succeed unless we also foster scientific research and assessment efforts to provide the information base on which these policies depend. It is fundamental that we have adequate data on fish population dynamics, assessment of stocks, the effects of pollution upon fish and so forth. We intend to insure that this nation has the scientific and technological base of knowledge vital to the development and prosecution of management policies.

In addition to these institutional measures, there are some technological avenues available to us for increasing the supply of product. For example, we must start developing fisheries and markets for latent stocks not presently widely used in the U.S. Many of these resources offer excellent opportunity for expanded domestic and export sales. We in the National Oceanic and Atmospheric Administration believe this is an area for increased Federal attention. We have begun programs of resource assessment and research into new harvesting techniques, as well as new processing and handling technology.

"We must conserve our fisheries resources and insure our fair share for our domestic fisheries.

"We must preserve our marine waters as a viable habitat for fish and shellfish.

"We must encourage and support the development of mariculture; and

"We must foster the growth of our industry and insure quality products at fair prices to the consumer."

While we are developing our management regimes we must dedicate ourselves to the preservation of the marine environment as a viable habitat for our fish and shellfish. In this effort the estuaries are equally as important as the ocean, where the bulk of the catch is taken. Some two-thirds of all our commercial species spend at least part of their life in the estuaries for spawning, for nursery areas, or for living and growing as adults. Our estuaries have been badly degraded over the last fifty years. For example, on Long Island, New York, one-third of the wetlands have been physically destroyed by dredging sand from the bay and filling the wetlands for housing and other development. These actions have destroyed the bottom and eliminated the productive wetlands.

". . . we must have comprehensive planning and management of our estuaries and inshore waters . . ."

Dredging of deep water channels and uncontrolled mining of sand and gravel have also taken their toll in the degradation of the estuaries as a suitable environment for fish and wildlife.

It is quite apparent that we must have comprehensive planning and management of our estuaries and inshore waters if we are to put into proper balance the many needs of people and industry. The Coastal Zone Management Act of 1972, establishing a joint State-Federal effort, was a major progressive step in that direction. This legislation sets up the machinery for the states, with Federal financial support, to develop comprehensive plans for the multiple use of the coastal zone taking into consideration the needs for industrial use of the resources, navigation and commerce, housing along the shore, recreation—ranging from bathing to sport fishing and commercial fishing.

As Senator Magnuson indicated in his keynote address yesterday morning, there are approximately 9½ million saltwater recreational fishermen in the United States. It is NOAA's position that both commercial and recreational interests must be considered in developing solutions and attaining our national goal. We must recognize that there are areas of agreement and also areas of disagreement between these two major fishing interests. It is generally agreed, by both of these interests and by the Federal government, that improved fisheries management is an absolute essential if we are to enhance the lot of our fishermen. We are developing a nationwide sport fisheries program that will include the identification of appropriate methods to help solve areas of conflict between marine sport and commercial fishermen.

" . . . mariculture . . . offers promise for the controlled production of many different kinds of fish and shellfish . . ."

When one talks about expanding the resource base available to us, one must consider the potential of mariculture. Although we have a long way to go in developing the science and technology of mariculture, there's no question in our minds that over the long term, it offers promise for the controlled production of many different kinds of fish and shellfish. We have been cultivating oysters and clams for years, but that is only the beginning. As you might expect, species of high economic value will be developed first. It is clear that the scientific understanding and the technology are now emerging for the mass artificial culture of salmon in pens, as is now being demonstrated in Puget Sound, and for the mass production of shrimp as well as shellfish. It is in this kind of new science and technology, using a systems approach, that the Federal government is beginning to make investments in collaboration with industry and the universities, which will enable private industry to move ahead by itself. In NOAA we are making increasing investments in mariculture, through our Sea Grant program and through our National Marine Fisheries Service.

Our fishing industry today, while it has been plagued with many vicissitudes, has some things going for it. We are working with industry to develop

new processing techniques, so that high quality products can be presented in a manner acceptable to the consumer at a fair price. At the same time we are exploring methods whereby our industry can take advantage of devaluation of our currency with the corresponding favorable price structure in foreign markets. We have the opportunity to develop fishery exports almost for the first time in our history. We in government must combine forces with industry in trying to attain this goal.

". . .the marine environment is still basically sound. . ."

The marine environment is still basically sound and there are expanding programs, both Federal and State, to keep it that way. Some of our fisheries are still prosperous, and with enlightened management we can restore others that are in trouble. We are already moving in that direction.

We still have a fishing fleet reasonably intact, a healthy processing industry, a wealth of technological know-how and a large potential market for the right products in the right places.

With these capabilities in mind, I want to emphasize again that we must press agressively to establish a management regime which will insure high levels of production and at the same time reserve for our domestic fishermen the maximum share of the stocks that they are capable of taking.

We in government are dedicated to attain these goals.

MFR Paper 1001. The paper above is from Marine Fisheries Review, *Vol. 35, No. 9, 1973. Copies of this paper, in limited numbers, are available from D83, Technical Information Division, Environmental Science Information Center, NOAA, Washington, DC 20235.*

MFR PAPER 1002

An artificial reef nearshore brings extra dollars to a South Carolina town.

Effects of an Artificial Habitat on the Marine Sport Fishery and Economy of Murrells Inlet, South Carolina

CHESTER C. BUCHANAN

ABSTRACT

Paradise Artificial Reef, in the Atlantic Ocean 3 miles from Murrells Inlet, South Carolina, received 35 percent of the angler-hours expended in the ocean sport fishery of the area and yielded over 40 percent of the catch. The survey estimated 1,905 boat-days of ocean sport fishing from June through September 1972. Catch per angler-hour and the species composition of catches while bottom fishing on Paradise Artificial Reef were about the same as those over natural rock reefs. Angler success for pelagic fishes on the reef was similar to that over natural habitats. The artificial reef was responsible for an increase of 16 percent in the number of private boat anglers in the ocean sport fishery and for an increase of nearly 10 percent in the gross economic impact of ocean sport fishing on the surrounding communities.

INTRODUCTION

Many artificial reefs are being built off the southeast coasts of the United States, but their impact on local sport fisheries and communities is relatively unknown. The purpose of this study was to determine if Paradise Artificial Reef off Murrells Inlet, S. C., had any significant effect on the size and species composition of private boat catches, the number and success of anglers, and the amount of business in nearby communities.

Only a few investigations have considered the relation between angler success and artificial reefs (Buchanan, 1972; Elser, 1960; Nelson, pers. comm.[1]; and Turner, Ebert and Givens, 1969). Most of the studies were inconclusive, but they suggested that angler success tended to be greater over artificial reefs than in surrounding areas.

Murrells Inlet has substantial offshore headboat[2], charter, and private fishing fleets. Most trips by headboats and charter boats are made in the summer to fishing grounds 15 to 60 miles offshore. The majority (98 percent) of the private boats, which are more active in the summer and fall, fish within a 13.5-mile radius of the inlet and are the only users of Paradise Artificial Reef (Figure 1).

The natural bottom habitat within the 13.5-mile radius of the inlet consists of sand, broken shell, mud, and scattered clumps of rocks. Rocky habitat constitutes about 8 percent of the natural bottom habitat.

Paradise Artificial Reef, located 3 miles from the inlet, has occasionally received additional material since its construction in 1963. The reef consists of over 30,000 scrap car tires and four vessels (ranging in length from 26 ft to 140 ft), and is marked by four buoys.

This study was part of a cooperative effort by the South Carolina Marine Resources Division, Coastal Plains Regional Commission, and the National Marine Fisheries Service to expand and evaluate the Paradise Artificial Reef (Stone, Buchanan, and Parker, 1973).

FISHING EFFORT

To estimate fishing effort, we divided the time between 0600 and 1800 hours into 2-hour periods for week days and 4-hour periods for weekend days, and counted the number of private boats leaving the inlet during randomly selected periods. Using a stratified random sampling design with proportional allocations we chose 12 week day (Monday through Friday) time periods and 6 weekend day (Saturday, Sunday, and holidays) time periods each month (one per sample day). We expanded our sample counts by formulas presented by Cochran (1963) to obtain estimates of the number of boat-days.

From these counts, we estimated that private boat anglers spent 1,905 boat-days (standard error 370.83) ocean fishing from June through Sep-

Chester C. Buchanan is a member of the staff of the Atlantic Estuarine Fisheries Center, National Marine Fisheries Service, NOAA, Beaufort, NC 28516.

[1]NMFS, AEFC, Beaufort, NC 28516

[2]A headboat is a vessel operated by a licensed captain which transports fishermen to fishing grounds daily for a fee per person on a first-come, first-served basis.

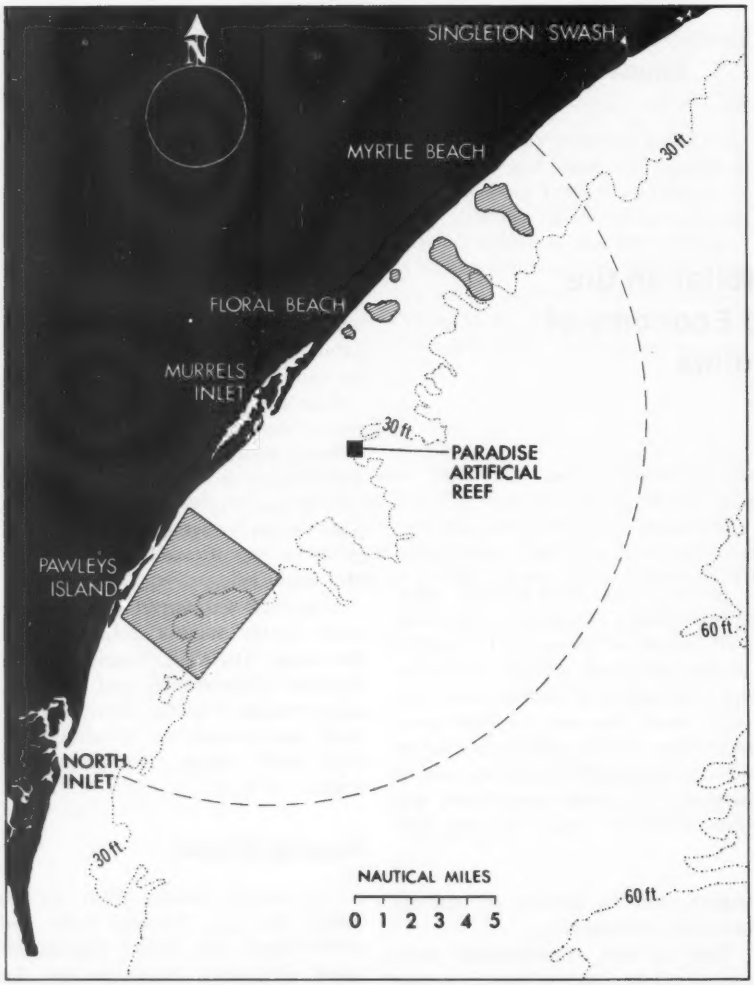


Figure 1.—The location and approximate size of Paradise Artificial Reef and natural, rock reefs (shaded area) within the survey area (dotted line) off Murrells Inlet, S.C. Pawleys Island Inlet and North Inlet are not navigable.

tember, 1972. About 46 percent of the bottom fishing effort and 19 percent of the surface fishing effort were over the reef (Table 1). Private boat anglers fished over the artificial reef more intensively than over natural habitats, even though the artificial reef consisted of less than 0.01 percent of the study area. The number of angler-hours per square mile of habitat (fishing intensity) spent over the artificial reef was almost 14,000 times the number of angler-hours spent over natural habitats (Table 2).

ANGLER SUCCESS AND SPECIES COMPOSITION

We estimated fishing success and catch composition of private boat anglers through mail questionnaires. While counting boats, we recorded the registration number of all private boats entering or leaving the inlet. After obtaining names and addresses from registration lists in North and South Carolina, we mailed each boat owner a questionnaire requesting information about his party's fishing activities for the day observed, a letter explaining the purpose of the survey, a pictorial key of the more common game fishes, a map of the popular fishing grounds, and a postage-paid envelope. We mailed a second request to the boat owners who did not respond within 2 weeks of our initial inquiry and a third request to those who failed to respond within 2 weeks of our second request.

We mailed questionnaires to 389 boat owners, or about 20 percent of the estimated number of fishermen, and received completed questionnaires from nearly 59 percent. From these questionnaires we estimated that during the summer private boat anglers caught nearly 16,000 pelagic fish and 31,000 bottom fish, representing 28 species (Table 1). Black sea bass (*Centropristis striata*), grunts (Pomadasyidae), and porgies (Sparidae), typical fishes of rocky habitats, constituted 52 percent of the catch. About 40 percent of the bottom fish and 32 percent of the pelagic fish were caught over Paradise Artificial Reef. Nearly 30 percent of the black sea bass and 45 percent of the grunts and porgies came from the reef.

We found no significant difference in the catch per angler-hour between the reef and the natural habitats for either pelagic or bottom species (Table 3). It would be difficult to identify a real difference, however, because of the large variance associated with each estimate. Anglers over the reef caught 0.89 fish per angler-hour less on the bottom, but 0.93 fish per angler-hour more at the surface, than over natural habitats.

Outcroppings of rock provide complex habitats that are similar to artificial reefs. Such habitats have a greater carrying capacity than flat, open bottoms (Carlisle, Turner, and Ebert, 1964; Turner, et al., 1969;

Table 1.—Estimated catch by the private boat sport fishery off Murrells Inlet by habitat and method of fishing, June - September, 1972.

	Artificial Habitat			Natural Habitat			
Method	Surface	Bottom	Mixed	Surface	Bottom	Mixed	Total
Angler-hours	1,941.8	3,489.1	1,734.2	8,282.9	4,109.7	1,553.4	21,111.1
Catch (No. Fish)	3,592	10,537	4,838	7,620	16,069	4,210	46,866
Fish							
Atlantic croaker					[1]		
Atlantic spadefish		85			[1]		85
Black drum		366					366
Black sea bass		2,040	1,589		6,313	2,249	12,191
Bluefish		37	293	662	1,091	163	2,246
Cobia		73	24	25	61	50	233
Gray triggerfish		[1]			[1]		
Grunts & porgies[2]		5,018	1,283		6,645	1,056	14,002
Gulf kingfish		464			600	50	1,114
Hakes[3]		[1]			12		12
Inshore lizardfish		[1]			[1]		
Jacks[4]		1,221	12	25	86	63	1,407
Mackerels[5]	3,579	12	1,100	6,883	86	302	11,962
Northern puffer		134	61		[1]		195
Oyster toadfish		61			[1]		61
Red drum					24		24
Searobins[6]		159			[1]	101	260
Spiny dogfish		[1]	24		184	13	221
Spotted seatrout		37	61		514	88	700
Summer flounder	13	830	391	25	453	25	1,737
Unknown						50	50

[1] Not reported caught but observed in some fish boxes.
[2] Pigfish, pinfish, porgies, spot, and tomate.
[3] Southern and Carolina hakes.
[4] Greater amberjack and blue runner.
[5] Cero, king and Spanish mackerel.
[6] *Prionotus* spp.

McVey, 1970). Excluding the artificial reef, private boat anglers expended nearly 70 percent of their bottom fishing effort and 10 percent of their surface fishing effort over rocky habitats. It was not unexpected, therefore, that both bottom fishing catch rates and species composition of catches from the rocky habitat and the artificial reef were similar.

Turner, et al. (1969) noted that a small, heavily fished artificial reef cannot sustain a high degree of angler success unless recruitment is rapid and continuous. This seems to be partially true of Paradise Artificial Reef; the reef received heavy fishing pressure, the catch rates remained high throughout the summer, and the total number of adult game fish harvested appeared to be several times larger than the adult game fish standing crop on the reef (estimated from limited observations with scuba). It seems unlikely that the growth of most resident juvenile species could have completely accounted for the surplus of adult game fish because the study period was too short to allow for sufficient growth. Therefore, it seems likely that recruitment from natural rock outcroppings augmented much of the adult game fish population on the reef, since these were the only nearby areas supporting numbers of reef fishes.

Table 2.—Fishing intensity rates, number of angler-hours per square mile, for private boat anglers over artificial and natural habitats off Murrells Inlet, S.C.

	Artificial	Natural
Angler-hours	7,165	13,946
Square miles of habitat	0.01	286.13
Intensity rates	716,500.00	49.0

LENGTH OF CATCHES

We measured fish at the marina patronized by most of the ocean anglers. Although 1,509 specimens were measured, this was just enough to allow a statistical comparison of lengths between the two habitat types for eight species (Table 4). Greater amberjack *(Seriola dumerili)* and summer flounder *(Paralichthyes dentatus)* from the reef were significantly larger and pigfish *(Orthopristis chrysoptera)* were significantly smaller than those from natural habitats. Lengths of black sea bass, pinfish *(Lagodon rhomboides)*, porgies *(Stenotomus* spp.), blue runner *(Caranx crysos)* and Spanish mackerel *(Scomberomorus maculatus)* did not differ significantly.

VALIDITY OF MAIL SURVEY

We collected information at dockside to test the validity of the mail questionnaire. While we counted the catch of each angler we asked him to use a pictorial key and identify the fishes he caught. One week later we mailed each fisherman a questionnaire, similar to those used in the mail survey, requesting information about fishing activities for the day interviewed. We mailed a second request to those who failed to respond within 2 weeks.

Estimates derived from mail questionnaires may be biased by response and non-response errors (Abramson,

Table 3.—Catch statistics for anglers completing mail questionnaires.

	Artificial Habitat			Natural Habitat		
	Surface Fishing	Bottom Fishing	Mixed[1]	Surface Fishing	Bottom Fishing	Mixed[1]
No. of questionnaires	27	35	15	113	45	17
Angler-hours	159.0	285.7	142.0	678.2	336.5	127.2
Catch (No. fish)	294	864	396	621	1,317	345
No. of species	2	20	12	5	16	14
Catch/angler-hour	1.85	3.02	2.79	0.92	3.91	2.71
Standard error of the catch/angler-hour	.844	.759	—	.142	.881	—
Mann-Whitney "*U*" test values for comparison of catch rates/method between habitats	1,461.5[2]	946[2]	No test			

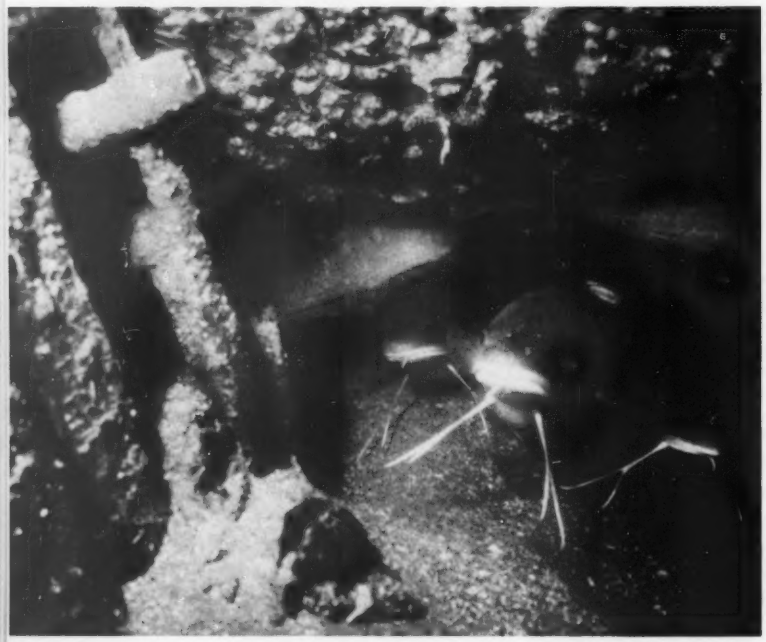
[1] Not able to separate data by fishing method.
[2] No difference at the 5% level of confidence.

Table 4.—Mean total length and standard deviation of some fish species caught over artificial and natural habitats. Paired *t* test values for comparison between habitats of a species average total length.

	Artificial Habitat			Natural Habitat			
	Mean total length mm	No.	Standard deviation	Mean total length mm	No.	Standard deviation	*t* test values
Black sea bass	213.3	69	65.2	213.4	263	49.8	0.006[1]
Blue runner	332.0	9	55.3	301.6	21	28.7	1.670[1]
Greater amberjack	351.8	29	57.5	307.9	9	7.4	2.260
Pigfish	218.9	99	20.8	227.3	169	16.9	5.340
Pinfish	192.8	128	14.3	197.2	77	19.33	1.930[1]
Porgies[2]	176.1	77	14.9	183.3	7	18.5	1.192[1]
Spanish mackerel	421.5	27	54.1	433.7	250	20.9	1.485[1]
Summer flounder	348.1	90	49.9	299.0	7	65.8	2.450

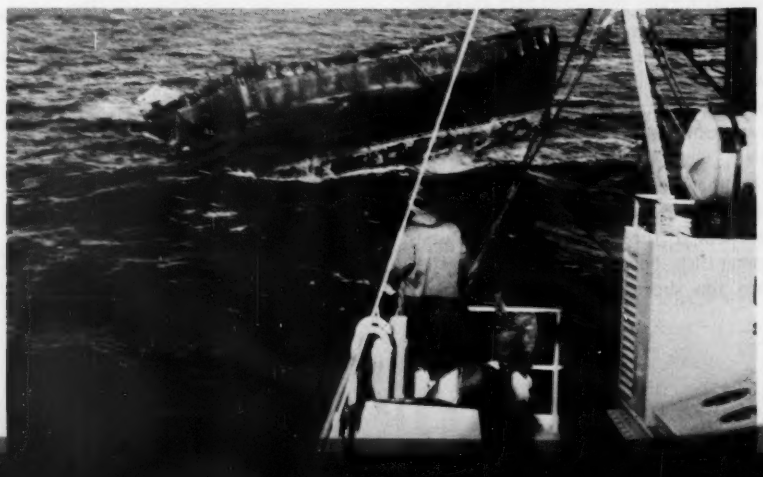
[1] No difference at the 5% level of confidence.
[2] *Stenotomus* spp.

(Below.) Scrap tires are frequently used as reef material because they are inexpensive, readily available, easy to handle and durable. They are the most numerous component of Paradise Artificial Reef.



(Above.) The function of artificial reefs is to duplicate those conditions that cause concentrations of fishes and invertebrates on rocky habitat. Many fish species are attracted to reefs for either protection, calm water, orientation or food.

(Below.) The largest vessel on Paradise Artificial Reef is a 140 ft steel barge which was sunk in 1970. Old vessels make effective additions to reefs because they often attract pelagic fishes as well as bottom fishes.



(Right.) By increasing the amount of rocky habitat, reefs have the potential of increasing the stock sizes of reef fishes.

(Left.) Many anglers come to the Murrells Inlet-Myrtle Beach area to fish over Paradise Artificial Reef. The reef increases their opportunities to catch fishes associated with rocky habitat.

1963), which in many instances may be quite large. We found both types of errors to be insignificant.

From our test data, we found no significant difference ($\chi^2 = 13.0$; *d.f.* 20; $P > 0.75$) between species identification by anglers at dockside or in questionnaires. Most anglers could recognize the popular gamefishes, such as summer flounder, black sea bass, king mackerel *(Scomberomorus cavalla)* and Spanish mackerel, but could not always recognize some of the less common fishes, such as cero *(Scomberomorus regalis)*, porgies, spot *(Leiostomus xanthurus)*, blue runner, and grunts. While the response error could affect our harvest estimates of the less common fishes, it could not significantly affect our harvest estimates of the popular fishes. In order to minimize this error in our estimates of the less common species, we combined pigfish, pinfish, porgies, and spot in one group; cero, Spanish mackerel, and king mackerel in another; and blue runner and greater amberjack in a third.

We interviewed 52 parties at dockside to gauge the accuracy of information relative to that reported in questionnaires. Of nine categories compared for response error, only estimates of total catch, which anglers overestimated by 13 percent, were significantly different. There was no significant difference in the frequency of occurrence of either pelagic species or bottom species; therefore, we concluded that the catch of each species had been overestimated proportionally. Since our estimate of total harvest of each species was based on the frequency of occurrence, we were confident that our estimate of the total catch was accurate.

We also concluded that the nonresponse error was negligible. From dockside interviews, we determined the catch rates of a random group of anglers, and then compared the catch rates of those from this group who returned their questionnaires to the catch rates of those who did not return their questionnaires (Mann-Whitney *U* test; $U = 724.5$; $P > 0.35$). There was no significant difference.

Table 5.—Characteristics of nonresident anglers fishing out of Murrells Inlet, S.C. in privately owned and operated boats.

	Groups		
	I	II	III
No. parties interviewed	16.	72	14
Av. no. in party	5.7	5.4	5.6
Av. distance traveled	121	105	93
Av. trips/year	5.6	13.8	11.8
Av. days/trip	2.5	5.2	2.5
Private lodging	7	48	8
Rental lodging	8	24	1
Av. cost/trip	$53.60	$44.05	$36.85
Av. cost/day	$21.44	$ 8.55	$14.74

INFLUENCE OF REEF ON ECONOMY OF THE AREA

At the end of the summer, we requested information from non-resident anglers who participated in the fishing survey, concerning their expenditures and non-fishing activities in the Murrells Inlet-Myrtle Beach area. We mailed a second request to each angler who did not respond within 2 weeks. We received 102 completed questionnaires, which we separated into three groups:

Group I; anglers who would not return to the Murrells Inlet-Myrtle Beach area if Paradise Artificial Reef did not exist.

Group II; anglers who fished over the reef but would return even if the reef did not exist, and,

Group III; anglers who did not fish over the reef.

Of the anglers who responded, only 14 percent (Group III) had not fished over the reef (Table 5). Of those who had fished over the reef, 82 percent said they would return if the reef were absent (Group II), and 18 percent said they would not return (Group I). Anglers in Group I represented the net increase in the number of anglers due to Paradise Artificial Reef.

Anglers in Groups II and III had similar characteristics that were different from those of anglers in Group I. Anglers in Group I cited fishing as their main reason for coming to the area, while those in Groups II and III cited reasons other than fishing

(Above.) National Marine Fisheries Service diver-biologists have been studying the ecology of Paradise Artificial Reef since 1970. Their studies include dynamics of fish stocks, distribution and behavior of reef fishes and succession of invertebrates.

beaches and seasonal homes. Generally, anglers in Group I lived farther from the area than those in Groups II and III, made fewer trips during the year, but fished about the same number of days per trip. One-half of Group I and three-fourths of Groups II and III were from South Carolina. Most of those in Groups II and III stayed in private homes, and most of those in Group I stayed in public lodgings. Anglers in Group I spent nearly twice as much money per man-day as those in Group II, and about a third more than Group III. Anglers in Groups II and III spent less money in the area because most of them stayed in private homes and brought many of their supplies with them.

From these responses, we estimated that nonresident anglers, who ocean-fished from private boats while in the Murrells Inlet-Myrtle Beach area, spent $36,000 during the summer in the area; Group I spent $3,132 (8.7 percent), Group II $28,800 (80.0 percent) and Group III $4,068 (11.3 percent). This money was spent mostly for gas, oil, bait, tackle, food, launching fees, and lodging. We did not include in our estimate money spent for taxes, maintenance cost, and related expenses for seasonal homes.

CONCLUSIONS

Anglers experienced bottom fishing success over the Paradise Artificial Reef similar to that obtained over natural rock reefs. For bottom species their catch rates (catch per angler-hour) were similar and, except for three species (summer flounder, greater amberjack and pigfish), the species composition of their catches did not differ from that of catches over natural rock reefs. The average summer flounder and greater amberjack caught over the reef were larger than those caught over natural rock reefs. For pelagic fishes angler success over the reef and natural habitats did not differ.

The reef provided a productive fishing site within easy access of Murrells Inlet. Bottom fishing at the reef site before construction was relatively unproductive as compared with natural rock reefs. The nearest major rock outcropping, where anglers had good bottom fishing success, was nearly 7 miles from the inlet.

Paradise Artificial Reef, which was intensely fished during the summer by private boat anglers, received nearly 35 percent of the offshore angler-hours and yielded nearly 40 percent of the catch. The reef increased fishing opportunities by providing a good fishing site close to the inlet and increased utilization of fishes associated with rocky habitats.

The reef attracted anglers and had a positive effect upon the economy of the Murrells Inlet-Myrtle Beach area. Nearly 16 percent of the private boat anglers active in the ocean sport fishery during the summer were attracted to this area because of the reef. The money spent by the additional anglers amounted to nearly 10 percent of the money spent by all ocean fishermen.

ACKNOWLEDGMENT

I wish to acknowledge William R. Nicholson, who critically reviewed the manuscript several times and made many valuable suggestions as to presentation, and Richard B. Stone for his counsel during the survey and his assistance with the writing.

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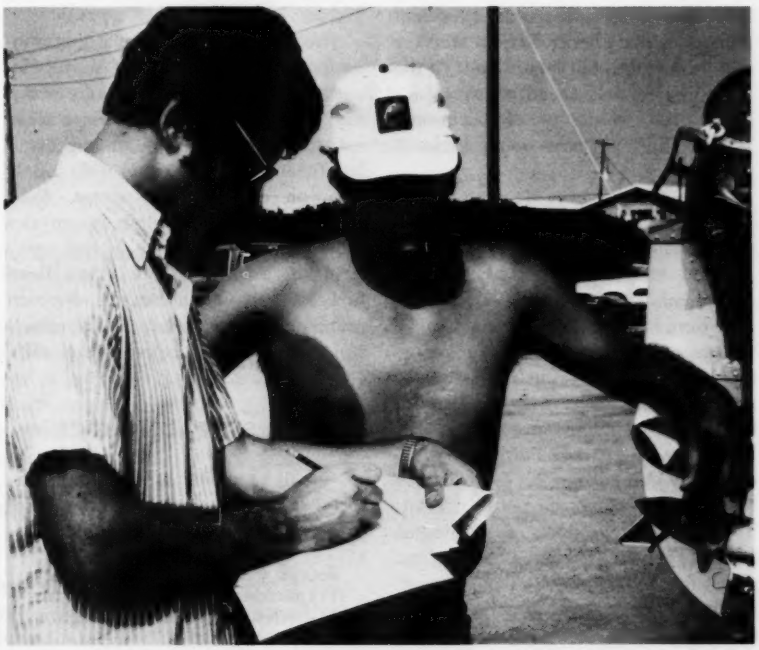
(Below.) National Marine Fisheries Service personnel interviewed anglers to determine the validity of techniques used to survey anglers fishing off-shore of Murrells Inlet, S.C.



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MFR Paper 1002. The paper above is from Marine Fisheries Review, *Vol. 35, No. 9, 1973. Copies of this paper, in limited numbers, are available from D83 Technical Information Division, Environmental Science Information Center, NOAA, Washington, DC 20235.*

MFR PAPER 1003

Timely tips on coping with the energy crisis for fishermen troubled by tight fuel supplies.

Fuel Shortages and the Fisherman

JOSEPH PILEGGI

Energy resource shortages are going to plague us for some time. President Nixon, in his Energy Policy Message to Congress on April 18, said, "In the years immediately ahead, we must face up to the possibility of occasional energy shortages and some increase in energy prices."

Since 1965, energy demand in the U.S. has risen substantially—the average annual increase has been 4.8 percent. At this rate, 1984 energy requirements will be almost double what they were in 1970.

Our energy demands have grown so rapidly they now outstrip our available supplies. Along with the soaring demand, domestic production of energy is stagnating. Petroleum products are among the energy resources for which shortages currently prevail. Two of those products of particular interest to the fishing industry are diesel fuel and gasoline. The shortage of these products is affecting many sectors of the economy including fishing vessel operators, agriculture, and service carriers of all types.

The diesel fuel problem is a continuation of the larger, tight supply situation for petroleum products which has been developing for some time, and the extremely tight middle distillate (heating oil and diesel fuel) supply situation of this past winter. Even though the middle distillate inventories are now about the same as last year's level, those attempting to secure diesel fuel in bulk quantities at discount prices either for resale or for direct consumption are experiencing difficulties.

FISHERIES IMPACT VARIES

Not all segments of the fishing industry have felt the effect of the diesel fuel shortage. Up to now,[1] it has been principally concentrated in the South Atlantic and Gulf areas where fishing vessel operators have reported that diesel fuel is being allocated by the suppliers, in many instances, in amounts equal to the amount purchased the previous year. In some cases, the amount allocated has been less than the amount purchased during the previous year with some reporting that the cut has been as much as 30 percent. But with the advent of spring, the supply situation improved. However, there are still reports of spot shortages.

There have been numerous reports from the Gulf and South Atlantic that prices have advanced substantially but this has been the case throughout the nation.

The only other segment of the industry that has been affected by the fuel shortage to date was the tuna fishing fleet fishing in the Eastern Tropical Pacific and going into Latin American ports for refueling. But recent reports indicate that the tuna vessels are not experiencing the same amount of difficulty in obtaining fuel as they did several months ago.

Gasoline is of some importance to certain segments of the fishing industry and this product is also reported in short supply. The gasoline outlook reveals the possibility of localized shortages during the peak use period this summer as a result of low inventory levels. In those areas that are served primarily by independent marketers, it is likely that the tightness of

Joseph Pileggi is the Emergency Preparedness Coordinator for Fisheries, NMFS, Washington, D.C.

[1]This paper reflects the energy problem status as of its writing, July 1973.

the spot gasoline market will be more acutely felt.

SHORTAGES DO NOT WARRANT FEDERAL ENERGY RATIONING

Darrell Trent, Acting Director of the Office of Emergency Preparedness and Chairman of the President's Joint Board on Fuel Supply and Fuel Transport, released on April 27 a survey of fuel and energy problems for spring and summer 1973, prepared by the Joint Board. The report stated: "While gasoline shortages may occur in some areas of the nation, and may require State and local action to overcome problems, the shortages are not expected to be of a severity to warrant rationing by the Federal government."

On May 10, 1973, Deputy Secretary of the Treasury William E. Simon announced a new voluntary petroleum allocation program (Figure 1), which is being administered by the Office of Oil and Gas, U.S. Department of the Interior. But allocation does not solve the shortage—it merely is an effort to see that everyone gets a fair share of the available supply. All of us may have to get by with a little less for a while.

The program for allocation of crude oil and refinery products , is voluntary and backed up (1) by guidelines established by the government, (2) a mechanism for providing continuing scrutiny of compliance with these guidelines, and (3) the threat of imposition of more stringent regulations requiring reallocating crude oil and products should this program fail. General policy direction will be vested in the Oil Policy Committee; day-to-day administration of the program, in the Office of Oil and Gas (OOG). An oil allocation section has been established in OOG to administer the program.

Under the program, each producer, refiner, marketer, jobber, and distributor will agree to make available in each state to each of its customers (including those purchasers in the spot market) the same percentage of its total supply of crude oil and products that it provided during each quarter of a base period (defined as the fourth quarter of 1971 and the first three quarters of 1972).

What Can Fishing Vessel Operators Do?

1. Conserve fuel by:
   A. Frequent tune-ups and cleaning of filters
   B. Keep running time to a minimum
   C. Shutting off engines when not in use
   D. Slowing down for maximum use of fuel.
2. Form buyer cooperatives and build fuel storage facilities.
3. Make contractual arrangements instead of buying on the spot market.
4. Don't come back to port without a full trip.
5. Frequent only known fishing grounds.
6. Fish closer to your home port if possible.
7. Organize a buy-boat system to cut down on returning to port after trip is completed.
8. Spend less time searching for fish by cooperating with other fishermen in locating and reporting concentrations of fish.

For Assistance in Obtaining Diesel Fuel Or Gasoline, Follow This Procedure

(If "1" fails, try "2", etc.)

1. Advise your supplier that *fishing*, farming, and dairy activities and services have been designated as priority categories for fuel supply.
2. Contact your local agricultural County Agent.
3. Register your complaint with the Voluntary Petroleum Allocation Program, Office of Oil and Gas, U.S. Department of the Interior (Winder Building, 1723 F Street, N.W., Washington, D.C.) by telephone (202) 254-8040. For the type data you are required to supply, see Figure 1. Send a letter to the National Marine Fisheries Service supplying the same information.
4. Telephone the National Marine Fisheries Service, NOAA, U.S. Department of Commerce, Washington, D.C. 20235, attention Mr. Joseph Pileggi, Emergency Preparedness Coordinator for Fisheries, at (202) 343-6855.

PRIORITY ALLOCATIONS

Under the program, OOG may assign to each producer, refiner, marketer, jobber, and distributor, allocations for priority customers still unable to obtain needed supplies of crude oil and products, not to exceed 10 percent of any supplier's total sales of crude oil and products during the base period. This assignment by OOG will be based upon demonstrated need. The basic purpose of the assignment is to assure adequate supplies of crude oil and products to priority users who, for some reason, are not well served under the proportional allocation program. It will be particularly important for fulfilling the needs of

Recorded by: (Name) _____
(Date) _____

FUEL INCIDENT REPORT

OEP Region _____
Type Fuel _____
Priority: Routine _____
Congressional _____
Urgent _____

Name and address of company:
Name _____
Street _____
City & State _____

Name of contact(s): _____
_____
Phone numbers: _____

Type business: _____
Type and number of
customers (% kind): _____
Prime supplier(s): _____
_____
Person and phone
no. to contact: _____
Contract expiration date: _____

Allocation: _____
Normal Requirement per month: _____
Inventories and date: _____

Purchases during the base period:
4th Quarter '71 _____
1st Quarter '72 _____
2nd Quarter '72 _____
3rd Quarter '72 _____

Remarks: _____
_____

Figure 1.—Type of report form used by the Operations Center of the Voluntary Petroleum Allocation Program, Office of Oil and Gas, when they receive a complaint by telephone. Boat operators should be prepared to supply the information indicated and use the same format in registering a complaint by telephone.

new customers that have entered the marketplace since 1971-72.

In distributing the oil for OOG allocation, priority will be given to supplying the following activities or to independent marketers, jobbers, and refiners who supply the following activities:

1. Farming, dairy, and *fishing* activities and services directly related to the cultivation, production, and preservation of food.

2. Food processing and distribution services.

3. Health, medical, dental, nursing, and supporting services except commercial health and recreational activities.

4. Police, fire fighting, and emergency aid services.

5. Public passenger transportation, including buses, rail, intercity and mass transit systems, but excluding tour and excursion services.

6. Rail, highway, sea, and air freight transportation services, and transportation and warehousing services not elsewhere specified.

7. Other state and local government activities.

8. The fuel needs of residents in states or parts of states not well served by major oil companies and unable to obtain sufficient crude oil or products.

Wholesale and retail marketers of gasoline shall not be deemed priority customers unless they supply a substantial proportion of their product to these priority users.

When convenient, various companies may exchange supply obligations incurred under this program in order to simplify distribution problems.

COMPLAINTS CAN BE MADE

The Office of Oil and Gas will receive complaints from anyone who feels he is not receiving a proper allocation of supplies. If it deems it necessary, OOG may require a public hearing and submission of data, by suppliers, on their 1971 and 1972 exchanges and/or sales of crude oil, unfinished oils, and products. These data will include the names and addresses of customers, the amounts of crude oil and products sold to them, the legal relationship between major oil companies and customers, and whatever other information OOG believes necessary to conduct the hearing. The OOG will then verify the accuracy of complaints against a supplier, and, if justified, impose mandatory allocation on the supplier.

The price at which petroleum products shall be sold to independent marketers, wholesale distributors, and other unaffiliated customers shall not exceed normal refinery rack prices charged by major companies to new contract customers. The price which wholesale distributors may charge independent marketers shall not exceed normal wholesale prices, or normal refinery rack prices plus a normal wholesale markup.

Where independent refiners have previously received domestic crude oil in exchange for import tickets, the independent refiners will be required to surrender license-fee exempt quotas in return for receiving the privilege of purchasing crude oil under the program. Where the independent refiners previously purchased crude oil without surrendering import tickets, no license-fee exempt quotas will have to be surrendered. The price at which crude oil shall be sold to independent refiners shall not exceed posted crude oil prices plus an applicable pipeline transportation charge except, however, where crude oil is sold as required based upon previous exchanges of import tickets for domestic oil, the major companies may charge a price equivalent to the average landed cost of any oil imported to replace the oil sold under the provisions of this program.

Table 1.—Regional contacts in the Voluntary Petroleum Allocation Program for those who would like to make local contacts regarding the fuel shortage.

OEP Region	City	Telephone
1. Philip Bassett	Boston	(617) 223-4271
2. Joseph Mastroianni	New York	(212) 264-8980
3. William Swarm	Philadelphia	(215) 597-9416
4. John Heard	Atlanta	(404) 526-3641
5. Terrace Vangan	Chicago	(312) 353-1500
6. John DeLa Garza	Dallas	(214) 749-1411
7. Paul Ward	Kansas City	(816) 374-5913
8. Harvey McPhail	Denver	(303) 234-3271
9. Ken Mosier	San Francisco	(415) 556-8794
10. John Makey	Seattle	(206) 442-1310
OOG Field Offices		
1. —	Boston	(Call OEP Region 1)
2. —	New York	(212) 264-8980
3. —	Philadelphia	(215) 597-9403
4. Maynard Stephens	New Orleans	(504) 527-6681
5. John Schaberg	Chicago	(312) 353-5119
6. Albert E. Sweeney	Denton, Texas	(817) 387-5811
7. Warren Mankin	Denver	(303) 234-2596
8. —	(Covered by OOG Reg. 7)	
9. Eugene Standley	San Francisco	(415) 556-2833
10. W. Glen Andrea	Houston (Covered by OOG Reg. 9)	8-713-226-5487

IMPROVED ALLOCATION PROGRAM IS EXPECTED

The Oil Policy Committee conducted hearings beginning June 11, 1973, to determine any changes that may be required to make the program equitable to all classes of suppliers and purchasers, and whether the program should be made mandatory. The Chairman of the Oil Policy Committee designated an ad hoc board to conduct such hearings and report its findings to the Oil Policy Committee. The Board was composed of representatives of the Interior, Treasury, and Commerce Departments, GSA/OEP as well as the Cost of Living Council and the White House Energy Office observers. The Oil Policy Committee is now receiving the results of the public hearings and expects to promulgate an improved allocation program shortly.

The Oil Policy Committee will also investigate and recommend additional measures that should be undertaken to encourage allocations by major suppliers. For example, it will investigate changes in Cost of Living Council rules and environmental standards and regulations that seem necessary to assure efficient utilization and equitable distribution of crude oil and products.

Table 2.—Office of Oil and Gas (OOG) Regional Offices, addresses, telephone numbers, and States covered by region.

OOG Region 1
Custom House Building
10th Floor
2 India Street
Boston, Massachusetts 02109
Telephone: Temporarily unoccupied (call OOG Rep. at OEP Region 1)
States covered: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.

OOG Representative, OEP Reg. 1
JFK Federal Building
Room 2003 E
Boston, Massachusetts 02203
Telephone: (617) 223-4271

OOG Representative, OEP Reg. 2
26 Federal Plaza, Room 1347
New York, New York
Telephone: (212) 264-8980
States covered: New Jersey, New York, Puerto Rico, and the Virgin Islands

OOG Representatives, OEP Reg. 3
2 Penn Center Plaza
Suite 915
Philadelphia, Penn. 19102
Telephone: (215) 597-9403
States covered: Delaware, Maryland, Pennsylvania, Virginia, District of Columbia, and West Virginia.

OOG Region 4
South Street Federal Building
Old Federal Square, Room 650
600 South Street
New Orleans, Louisiana 70130
Telephone: (504) 527-6681
States covered: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, and the Canal Zone.

OOG Representative, OEP Reg. 4
1375 Peachtree Street, N.E.
Suite 750
Atlanta, Georgia 30309
Telephone: (404) 526-3641

OOG Region 5
300 South Wacker Dr.,
Room 565
Chicago, Illinois 60606
Telephone: (312) 353-5119
Telephone: (312) 353-1818
States covered: Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin.

OOG Representative, OEP Reg. 5
300 South Wacker Dr.,
Room 520
Chicago, Illinois 60606
Telephone: (312) 353-1500

OOG Region 6
Federal Center
Denton, Texas
Telephone: (817) 387-5811
States covered: Arkansas, Louisiana, Oklahoma, New Mexico, and Texas.

OOG Representative, OEP Reg. 6
Federal Building
1100 Commerce Street
Room 13028
Dallas, Texas 75202
Telephone: (214) 749-1411

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DIESEL TO WORSEN

As far as diesel fuel is concerned, the supply situation is expected to worsen next winter. The tight fuel situation is further aggravated by the additional constraints on fuel use resulting from environmental regulations. The consensus is that there is really nothing at all we can do over the next 2 or 3 years about tight supplies of motor fuel (diesel fuel and gasoline) and heating oil. Over the next several years, we must recognize the possibility of occasional and localized shortages of various fuels.

One of the immediate measures taken by the President to alleviate the situation was the thorough restructuring of our oil import program which should help to mitigate the fuel and gasoline problem this summer and next winter. The President has removed all existing tariffs and quantitative limitations on imported crude oil and refined products. In their place, he has instituted a graduated fee system which became effective on May 1.

Fundamentally, it is also the consensus that a steady rise in petroleum product prices is inevitable over the coming years, and that this will be incentive enough for users to conserve fuel.

The President's Fuel Board is calling for consumer cooperation to help cope with the tight fuel oil and gasoline supply. Prudence in the use of all fuels should be exercised. Conservation of fuel is the keynote—all Americans are urged to use fuel and electric power in a manner that eliminates wasteful and excessive use. It is time to tighten our fuel belt and stop wasting fuel and this saves money too.

MFR Paper 1003, from Marine Fisheries Review, *Vol. 35, No. 9, September, 1973. Copies of this paper, in limited numbers, are available from D83, Technical Information Division, Environmental Science Information Center, NOAA, Washington, D.C. 20235.*

MFR PAPER 1004

A new study shows that between 23 and 45 percent (by weight) shrimp caught by a Texas trawler were discarded.

Shrimp Discarding by the Commercial Fishery in the Western Gulf of Mexico

KENNETH N. BAXTER

Kenneth N. Baxter is a Staff Assistant at the National Marine Fisheries Service Gulf Coastal Fisheries Center. This paper is Contribution No. 371 from the NMFS Gulf Coastal Fisheries Center, Galveston Laboratory, Galveston, Texas 77550.

Small brown shrimp (*Penaeus aztecus*) have been discarded at sea by commercial shrimp fishermen along the coast for many years. There are three apparent reasons why small shrimp are discarded: (1) the minimum size that can be landed legally in Texas ports is 65 "tails" per pound, (2) box-grading of shrimp by processors encourages discarding of smaller shrimp at sea, and (3) the vessel crews are often unable to "head" the entire catch at sea, so they concentrate on the larger shrimp which bring the best price, and they discard the smaller ones of lesser value.

In a previous study (Berry and Benton, 1969), the average quantity of brown shrimp discarded represented 33 percent of the catch by number and 22 percent by weight (Figure 1).

In June, 1972, another study was conducted aboard a commercial shrimp trawler operating from Port Isabel, Texas, and observed discarding varied between 23 percent and 45 percent by weight per tow in four tows during a 3-night trip (Table 1).

The report, "Trends and Conditions of the Fisheries of Texas for May 1972" (Orman H. Farley), stated that 300 pounds of shrimp were thrown overboard for every 100 pounds retained along the southern coast of Texas in late May. The June report from the same author stated that "culling was moderate to heavy all month." Verbal reports indicated that discards decreased from about 60 percent of the catch (by weight) in early June to 20 percent by the end of the month.

Table 1.—Shrimp catches and discards from a commercial vessel[1] June 23-25, 1972, off the southern coast of Texas.

Date	Pounds (heads-on)			Percent discarded (by weight)	Minimum size kept (tails/lb)
	Catch	Kept	Discarded		
6-23-72	244	188	56	23	130
6-24-72	450	300	150	33	130
6-24-72	375	225	150	40	90
6-25-72	788	450	338	43	50
Total	1,857	1,163	694		

[1] Fishing was carried out in 19 to 22 fathoms.

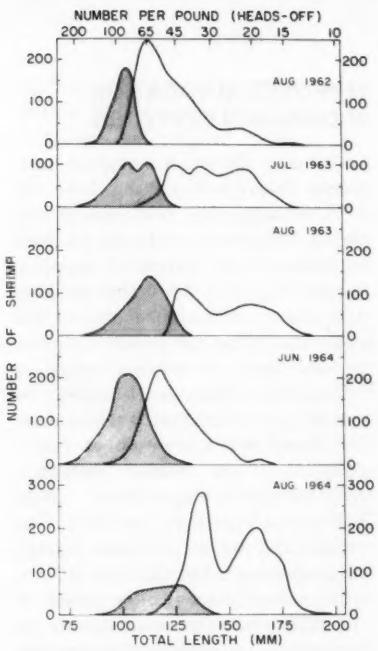

Figure 1.—Length-frequency distributions of brown shrimp that were discarded (shaded areas) or kept (unshaded areas) on the Texas shrimping grounds (from Berry and Benton, 1969).

Discarding is recognized as a problem worthy of further investigation. The Texas Parks and Wildlife Department plans to study discarding of shrimp, and Texas A&M University recently began a study to determine the extent of discarding of marine organisms including small shrimp by trawlers. Hopefully, such studies will lead to a remedy acceptable to the industry and compatible with wise management and utilization of shrimp resources.

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MFR Paper 1004. The paper above is from Marine Fisheries Review, *Vol. 35, No. 9, 1973. Copies of this reprint, in limited numbers are available from D83, Technical Information Division, Environmental Science Information Center, NOAA, Washington, DC 20235.*

MFR PAPER 1005

Tests show that traps are a better means of catching sablefish than trawls.

Results of Comparative Trawl and Trap Fishing off Oregon for Sablefish, *Anoplopoma fimbria*

NORMAN B. PARKS

ABSTRACT

A comparison of catches taken in trawls and traps fished at the same time and location off northern Oregon indicated that the traps were more selective for sablefish. Moreover, the trap-caught sablefish averaged 5.2 inches longer than, and were twice as heavy as the trawl-caught sablefish (average fork length 21.0 inches, average weight 3.4 lb). The percentage of marketable sablefish (4 lb or heavier) in the trap catches was 93.3 percent, but only 57.2 percent in the trawl catches.

Sablefish, *Anoplopoma fimbria*, also known as black cod, range from Cedros Island, Baja California, to the Bering Sea and Japan (Miller and Lea, 1972). They occur from the intertidal zone to depths of almost 900 fathoms but are most commonly taken in trawl catches off Oregon and Washington at depths between 100 and 500 fathoms (Alverson et al., 1964). Sablefish have long been an important species in the longline and trawl fisheries along the Pacific coast of the United States and British Columbia. These fish are usually smoked or salted, but are not often sold fresh because of their high oil content.

Scientists of the National Marine Fisheries Service (NMFS) in Seattle have been experimenting since 1969 with trap fishing systems to capture sablefish. Initially, the work was aimed at determining the feasibility of using traps to harvest sablefish (Hipkins and Beardsley, 1970; Hughes et al., 1970). More recently, traps have been used to capture sablefish for tagging in growth and migration studies.

The traps have been successful in catching sablefish, and experience indicates they are selective for this species (Hughes et al., 1970). An opportunity to compare the catches of traps and bottom trawls took place in October 1971, when a 17-day cruise was made on the NMFS research vessel *John N. Cobb* to assess the sablefish resource off the northern Oregon coast. During the cruise, traps and trawls were fished simultaneously in the same location.

Norman B. Parks is a member of the staff of the NMFS Northwest Fisheries Center, 2725 Montlake Boulevard East, Seattle, WA 98112.

FISHING GEAR

Gear included 28 collapsible, rectangular fish traps, 8 feet long by 34 inches wide by 34 inches high. The traps were constructed of 10-gauge steel mesh with 2- by 2-inch openings (Figure 1). All traps had a single fyke-type tunnel entrance constructed of nylon web (High, 1971). Each tunnel was fitted with a closing device consisting of a nylon noose, large rubber bands, and a magnesium-link closing device which closed the tunnel after approximately 24 hours of fishing to standardize fishing times. Traps were fished five per string and attached at 100-fathom intervals to a 5/8-inch polypropylene groundline with a 6-ft gangion ending on a snap-swivel. Each end of the string was rigged with a 35-lb halibut anchor, polypropylene buoy line, inflatable surface buoys, and a lighted flagpole. Cut herring placed in perforated 2-quart plastic jars was used to bait the traps. The jars were loose in the traps.

The trawl was a standard 400-mesh Eastern otter trawl with a 71-ft headrope, and was constructed of 4-inch-mesh nylon with 3½-inch-mesh cod end and rigged with eleven 8-inch-diameter trawl floats. Galvanized steel V-doors, 5 by 7 feet, were used with 30-fathom dandylines.

METHODS

All fishing was conducted in an area between 25 and 34 nautical miles southwest of the mouth of the Columbia River. Originally, two trawl hauls were planned, setting two strings of trap gear at 50-fathom-depth intervals between 100- and 450-fathom depths, but severe weather conditions during most of the cruise restricted sampling to depths of 100, 150, 200, and 250 fathoms and to only one trawl haul at each depth of sampling. The two strings of traps were set approximately 4 nautical miles apart at each depth, except at 250 fathoms where five strings were set. The single trawl haul at each

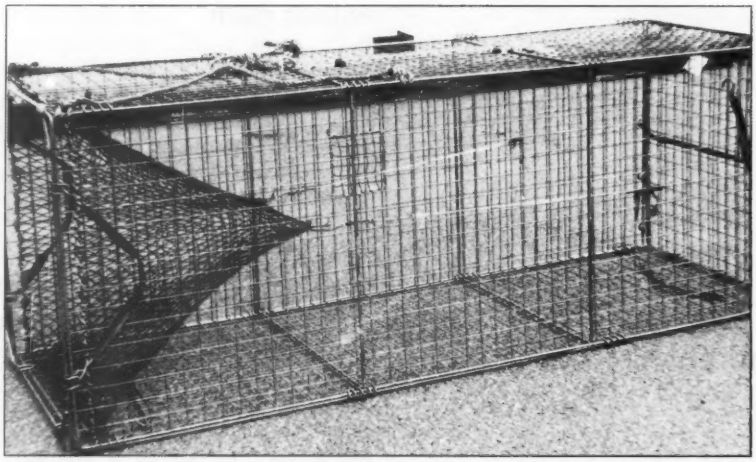

Figure 1.—Collapsible sablefish trap with single fyke and magnesium-link closing device.

depth was made between the two strings of traps. Trawl hauls at 100, 150, and 250 fathoms were of 1-hr duration; the haul at 200 fathoms was abbreviated because the net snagged after 14 minutes of fishing.

RESULTS

The composition of the catches by the two types of gear indicate that the traps were selective for certain species, particularly sablefish (Table 1). At 200 and 250 fathoms, they captured only sablefish. At 100 fathoms the traps also caught Pacific halibut, lingcod, and Dungeness crab; at 150 fathoms they took arrowtooth flounder, Pacific halibut, and lingcod, in addition to sablefish. In contrast to the trap gear, the trawl captured a variety of fish, including rockfish, Pacific hake, arrowtooth flounder, sole, and sablefish.

Catches of sablefish by both types of gear generally increased with depth, but differed distinctly in length and weight at all depths fished (Table 2). The mean round weights of trap- and trawl-caught sablefish taken at all depths were 6.8 and 3.4 lb, respec-

Table 1.—Species taken in traps and trawl hauls off northern Oregon in October 1971.

		Species by gear and depth							
		100 fms		150 fms		200 fms		250 fms	
Common name	Scientific name	Traps	Trawl	Traps	Trawl	Traps	Trawl*	Traps	Trawl
Sablefish	*Anoplopoma fimbria*	X	X	X	X	X	X	X	X
Brown cat shark	*Apristurus brunneus*	—	—	—	—	—	—	—	X
Spiny dogfish	*Squalus acanthias*	—	—	—	X	—	X	—	—
Big skate	*Raja binoculata*	—	X	—	X	—	—	—	X
Starry skate	*Raja stellulata*	—	X	—	X	—	X	—	X
Ratfish	*Hydrolagus colliei*	—	X	—	X	—	X	—	—
Pacific hake	*Merluccius productus*	—	—	—	X	—	X	—	X
Grenadier	Macrouridae	—	—	—	—	—	—	—	X
Pacific sanddab	*Citharichthys sordidus*	—	X	—	—	—	—	—	—
Arrowtooth flounder	*Atheresthes stomias*	—	X	X	X	—	X	—	X
Pacific halibut	*Hippoglossus stenolepis*	X	—	X	—	—	—	—	—
Petrale sole	*Eopsetta jordani*	—	—	—	X	—	—	—	—
Dover sole	*Microstomus pacificus*	—	X	—	X	—	X	—	X
Rex sole	*Glyptocephalus zachirus*	—	X	—	X	—	X	—	X
Lingcod	*Ophiodon elongatus*	X	—	X	—	—	—	—	—
Aurora rockfish	*Sebastes aurora*	—	—	—	—	—	—	—	X
Bocaccio	*S. paucispinis*	—	X	—	—	—	—	—	—
Silvergray rockfish	*S. brevispinis*	—	X	—	—	—	—	—	—
Canary rockfish	*S. pinniger*	—	X	—	—	—	—	—	—
Darkblotched rockfish	*S. crameri*	—	X	—	X	—	X	—	—
Redstripe rockfish	*S. proriger*	—	X	—	—	—	—	—	—
Pacific ocean perch	*S. alutus*	—	X	—	X	—	X	—	—
Stripetail rockfish	*S. saxicola*	—	X	—	—	—	—	—	—
Splitnose rockfish	*S. diploproa*	—	—	—	X	—	X	—	—
Yelloweye rockfish	*S. ruberrimus*	—	—	—	—	—	X	—	—
Redbanded rockfish	*S. babcocki*	—	—	—	X	—	—	—	—
Sharpchin rockfish	*S. zacentrus*	—	X	—	—	—	—	—	—
Greenstriped rockfish	*S. elongatus*	—	X	—	—	—	—	—	—
Rosethorn rockfish	*S. helvomaculatus*	—	X	—	X	—	X	—	—
Shortspine thornyhead	*Sebastolobus alascanus*	—	—	—	X	—	X	—	X
Eelpout	*Lycodes* sp.	—	X	—	—	—	—	—	—
Dungeness crab	*Cancer magister*	X	X	—	—	—	—	—	—
Total species		4	20	4	16	1	14	1	11

*This haul snagged and was pulled up after 14 minutes.

Table 2.—Comparison of lengths and weights of sablefish taken at three depths[1] by traps and trawl.

Depth (fm)	Gear	Number of sablefish	Mean fork length (inches)	Range (inches)	Mean round weight (lb)	Computed t 0.05 values
150	Traps	5	24.2	18.9-28.7	5.33	
	Trawl	45	18.3	14.2-25.6	2.21	
200	Traps	76	25.0	16.9-36.6	5.89	
	Trawl	6	22.4	18.1-35.4	4.13	
250	Traps	113	27.0	18.5-35.4	7.47	
	Trawl	330	21.5	16.1-37.8	3.65	
All depths	Traps	194	26.2	16.9-36.6	6.81	13.98*[2]
	Trawl	381	21.0	14.2-37.8	3.40	12.42*[3]

* Significant at the 0.05 level.
[1] The 100-fm depth was not included in the table since a total of only six sablefish were captured.
[2] Overall mean fork lengths (inches) compared.
[3] Overall mean round weights (lb) compared.

tively, whereas the mean lengths were 26.2 and 21.0 inches respectively. The calculated t values in comparing the mean lengths and weights of trap- vs. trawl-caught sablefish at all depths were significant at the 5 percent level (14.0 and 12.4, respectively). The percentage of marketable sablefish (4 lb or heavier round weight) was 93.3 percent of the trap-caught and 57.2 percent of the trawl-caught sablefish.

Length frequencies (Figure 2) and sex composition of sablefish taken in traps and those taken by trawl at 250 fathoms differed considerably. Large sablefish[1] predominated in the trap catches, whereas undersize sablefish comprised nearly half of the trawl catch. Of the trap-caught sablefish, 78 percent were females; whereas of the trawl-caught sablefish, only 39 percent were females.

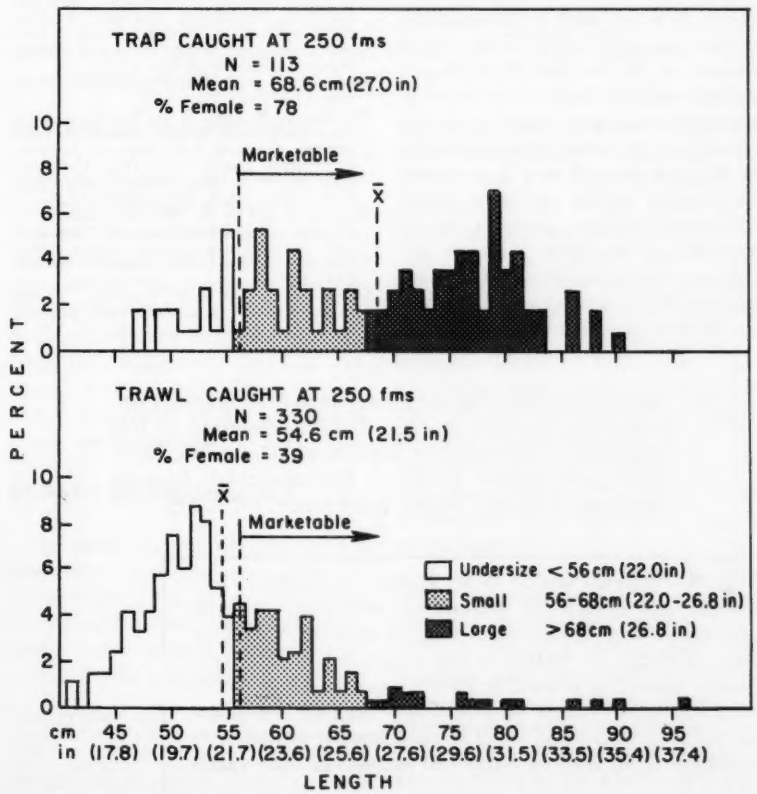

Figure 2.—Comparison of length frequencies of sablefish captured in traps and in trawl at 250 fathoms. Marketable fish are larger than 56 cm (22.0 inches) or greater than 4 lb round weight.

DISCUSSION

Large predatory bottom fishes are apparently most apt to be taken in the fish traps used. In coastal areas off the Pacific Northwest, these would include large specimens of sablefish, Pacifc halibut, arrowtooth flounder, lingcod, and some rockfishes. In previous cruises where traps were used, a few sole and rockfish were also captured in the traps (Hughes et al., 1970). During this cruise, however, none were caught in the traps although they were present in the trawl hauls. No Pacific halibut or lingcod and few large sablefish were captured in the trawl, but they did occur in some of the trap catches (Table 1). These fishes were probably able to avoid the trawl.

Both trap and trawl catches indicate the greater availability of sablefish at 250 fathoms than at lesser depths and represent relative indices of sablefish abundance. Data obtained during past cruises and from commercial vessels indicate sablefish catches in traps are usually greatest at depths between 200 and 400 fathoms. Heyamoto and Alton (1965) found that the catch rates for sablefish taken in trawls were usually highest at stations from 200 to 450 fathoms. At these depths, halibut, lingcod, arrowtooth flounder, and some rockfishes are less common than at lesser depths (Alverson et al., 1964).

Past data on trap catches also indicate that the catch ratio of sablefish to other species varies with depth,

[1] Commercial fish processors usually classify sablefish as being either large (greater than 26.8 inches), small (26.8 to 22.0 inches), or undersize (less than 22.0 inches).

evidently because of changes in species distribution with depth. This relation was indicated by 430 trap hauls (Table 3) made during 1970 by Captain Sig Jaeger[2] on the MV *Seattle* off Oregon, Washington, and British Columbia. In depths of less than 150 fathoms, incidental catches including rockfish, lingcod, and flatfish, ranged from 48 to 60 percent; at depths greater than 250 fathoms, the incidental catches dropped to 2 percent or less. Since most of the trap fishing in past years was conducted between 200 and 450 fathoms, these trap catches seem to indicate that traps are somewhat more selective for sablefish than would have been the case if they had been fished in shallower depths. Hughes et al. (1970), using large modified king crab-type traps at depths between 155 and 203 fathoms off the coast of Oregon, found that a total of 222 individual trap hauls took 29,157 lb of sablefish and an incidental catch of only five yelloweye rockfish, two Dover sole, one arrowtooth flounder, and one octopus. Regardless of relative abundance of different species, however, data collected to date suggest that sablefish are captured by traps more readily than are most other species.

The size differences between the trawl-caught sablefish (average fork length 21.0 inches[3]) and the much larger trap-caught sablefish (average fork length 26.2 inches, Table 2) must be primarily related to behavioral differences (trawl avoidance and more predaceous feeding habits of the larger sablefish) rather than mesh selectivity since the mesh sizes were similar in both types of gear (equivalent of 4-inch mesh stretch measure in the traps and 3½-inch mesh stretch measure in the cod end of the trawl). Female sablefish tend to be larger in size than males and therefore the difference in sex ratios between catches by the two types of gear (trap-caught 78 percent female vs. trawl-caught 39 percent female) is probably largely a result of the same behavior differences mentioned above. These behavioral differences between fish taken by the two gears work to the advantage of the trap fisherman. For example, Figure 2 shows that a greater proportion of large sablefish (>68 cm) was taken by trap gear than was taken by trawl gear in the same general fishing area. Undersize sablefish (<56 cm) are usually unmarketable on the Pacific coast and fishermen often receive considerably less per pound for small sablefish (56-68 cm) than they receive for large sablefish (>68 cm). In the catches shown in Figure 2, the trap-caught sablefish are considerably more valuable per pound than trawl-caught sablefish because of their larger average size.

Table 3.—Variation in incidental trap catches by depth. Data from 430 trap hauls by a commercial fisherman (Jaeger, personal communication).

Depth range (fm)	No. of traps hauled	No. of sablefish	No. of incidental fish	Percentage of incidental fish (by number)
76-100	7	1	1	50
101-125	17	15	14	48
125-150	41	55	83	60
151-175	25	211	24	10
176-200	10	60	41	41
201-225	38	390	23	6
226-250	57	449	15	3
251-275	144	1,641	39	2
276-300	91	1,185	18	1
Total	430	4,007	258	6.05

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[2] Personal communication. Sig Jaeger, Kodiak Community College, Box 946, Kodiak, Alaska 99615.

[3] Heyamoto and Alton (1965) found that the average fork length for trawl-caught sablefish taken between 150 and 250 fathoms in this same area during 1961 to 1963 was 51.5 cm (20.3 inches).

MFR Paper 1005. The paper above is from Marine Fisheries Review, *Vol. 35, No. 9, 1973. Reprints of this paper, in limited numbers, are available from D83, Technical Information Division, Environmental Science Information Center, NOAA, Washington, DC 20235.*

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MFR PAPER 1006

Frozen fish is principal form of seafood handled by midwestern wholesalers.

Marketing Practices of Wholesalers Handling Fish in the Akron and Cleveland Areas

LEONARD J. KONOPA

Leonard J. Konopa is a Professor of Marketing at the College of Business Administration, Kent State University, Kent, Ohio 44242.

ABSTRACT

The results of an exploratory survey among wholesalers in northeastern Ohio are reported. The forms of fish handled, sales trends, pricing policies, sources of supply, promotional techniques, product line preferences, and problems described by wholesalers are given.

NATURE OF THE PROJECT

In the Fall of 1970, Kent State University received a grant from the National Science Foundation to analyze (a) the market for fish in the Midwest, and (b) the channels of distribution for fresh fish. An initial explanatory survey among retailers and wholesalers in a two-county area was conducted from April through August 1971.[1] The results of the wholesalers' survey are summarized in this article.

SURVEY METHODOLOGY

An initial list of fish and seafood wholesalers was obtained from the yellow pages of the *Akron and Vicinity Telephone Directory* (Summit County, Ohio) as well as the *Cleveland Metropolitan Area Telephone Directory* (Cuyahoga County, Ohio). Names of other independent wholesalers in Summit and Cuyahoga Counties not contained in the yellow pages were found subsequently through interviews with retailers. Chain store warehouses that provided fish for their retail chain outlets were also added to the list. Finally, three establishments originally classified as retailers were transferred to the wholesaler category after interviews with their proprietors revealed their wholesale sales constituted more than 50 percent of their total sales volume. The names of 28 wholesalers were secured eventually in this manner.

A questionnaire concerning wholesalers' activities was constructed and pretested during the winter quarter, 1971. A copy of the questionnaire and a cover letter indicating the nature of the survey as well as the fact an interviewer would contact the recipient by telephone to arrange a mutually convenient time for a personal interview were mailed to each of the 28 wholesalers. The structured questionnaire was utilized in all of these personal interviews.

Usable replies were obtained from 25 distributors. Three refused to furnish data, saying the information was confidential. Fifteen of the 25 wholesalers who completed usable questionnaires were located in Cleveland, while ten wholesalers were from Akron.

CLASSIFICATION OF RESPONDENTS

The wholesalers were categorized for the purpose of analysis as either major line or minor line distributors of fish. A major line wholesaler's sales of fish range from 20 to 100 percent of their total annual sales volume. Conversely, firms whose sales of fish represent less than 20 percent of their annual sales volume were classified as minor line wholesalers. Overall, 13 of the 25 wholesalers were major line wholesalers. Nine of the major line wholesalers were Cleveland firms, four Akron. The 12 minor line wholesalers were split evenly with six firms in Akron and six in Cleveland.

FORMS OF FISH HANDLED BY WHOLESALERS

The different forms of fish were carefully defined in the questionnaire to reduce the likelihood of variances in wholesalers' responses arising from using identical terms in a different manner.

Data concerning the forms of fish handled by the wholesalers are presented in Table 1. Because the wholesalers in Summit County are located primarily in Akron and those in Cuyahoga County are based essentially in Cleveland, they are identified by the prefix "A" for Akron wholesalers

[1]The complete study, "Survey of Wholesalers Handling Fish in Cuyahoga and Summit Counties, Ohio," is a result of research sponsored by NOAA Office of Sea Grant, Department of Commerce, under Grant No. 2-35364, Application of Computer Technology and Advanced Physical Distribution Techniques to Seafood Marketing. Copies are available from the author.

and "C" for Cleveland wholesalers in Table 1.

The tabulations in Table 1 show clearly that frozen fish is the most widely handled form of fish. All of the major line establishments stock frozen fish as do 11 of the 12 minor line wholesalers. The next most widely handled form of fish is canned fish, with approximately 70 percent of the wholesalers in each group stocking this product. Finally, the form of fish handled least widely is fresh fish. Fresh fish, moreover, is distinctly a product offering of the major line rather than minor line wholesalers, since 10 of 13 major distributors handled fresh fish while just one of the 12 minor line distributors carried fresh fish.

Table 1.—Form of fish handled by Akron/Cleveland wholesalers.

Number Handling as Major or Minor Line[1]	Form of Fish Handled: Fresh — Ocean Finfish	Fresh — Ocean Shellfish	Fresh — Freshwater	Frozen — Ocean Finfish	Frozen — Ocean Shellfish	Frozen — Freshwater	Canned
Major Line ($N=13$)							
A-1	X	X	X	X	X	X	—
A-2	X	X	X	X	X	X	X
A-3	X	X	X	X	X	X	X
A-4	X	X	X	X	X	X	X
C-1	—	—	—	X	X	X	—
C-2	X	X	X	X	X	X	X
C-3	—	—	—	X	X	X	X
C-4	X	X	X	X	X	X	X
C-5	X	X	X	X	X	X	X
C-6	—	—	—	X	X	X	X
C-7	X	X	X	X	X	X	X
C-8	X	X	X	X	X	X	—
C-9	X	X	X	X	X	X	—
Subtotal	10	10	10	13	13	13	9
Minor Line ($N=12$)							
A-5	—	—	—	X	X	—	—
A-6	—	—	—	X	X	—	X
A-7	—	—	—	X	X	—	X
A-8	—	—	—	X	X	—	X
A-9	—	—	—	—	—	—	X
A-10	—	—	—	X	X	X	X
C-10	X	X	X	X	X	X	X
C-11	—	—	—	X	X	—	—
C-12	—	—	—	X	X	—	—
C-13	—	—	—	X	X	X	X
C-14	—	—	—	X	X	X	—
C-15	—	—	—	X	X	X	X
Subtotal	1	1	1	11	11	5	8
Grand total	11	11	11	24	24	18	17

[1] Responding Akron (A) and Cleveland (C) wholesalers are categorized as either major line fish dealers (20 percent or more sales) or minor line, with less than 20 percent total annual sales volume in fish.
Source: Survey Data.

PERCENTAGE OF WHOLESALERS' SALES BY FORM OF OF FISH HANDLED

Two problems were encountered in collecting data concerning the proportion of each wholesaler's sales by form of fish handled. The first problem was the number of nonrespondents and/or interviewees who were unable to break down their sales by form of fish handled. Among the major line wholesalers eight firms responded, while five refused to reply or did not know what proportion of their sales were derived from each variety of fish sold. The number of replies from the minor line wholesalers, however, was better, with nine of the 12 respondents providing this information.

The second problem was the wide dispersion in percentage of each firm's sales by form of fish handled as well as by the different forms of fish sold by each respondent. To provide a basis for comparison, a composite average percentage of sales by form of fish was calculated for the major and the minor line wholesalers. The composite percentage of sales pattern was obtained by totaling the percentage sales for each form of fish and dividing by total number of major or minor line respondents in their respective groups. The results are given in Table 2.

These data indicate that major line wholesalers derive the greatest portion of their sales from whole or processed fish while the minor line wholesalers rely on prepared fish. It also shows that while both groups obtain most of their sales from frozen, rather than fresh fish, the minor line wholesalers' percentage is much higher than that of the major line wholesalers.

MARKUP POLICY VARIATIONS

Wholesalers' markup policies are complicated by the fact that they may resell to perhaps five different types of buyers (i.e. household consumers, restaurants, institutions, retail food stores, and other wholesalers).

Major line wholesalers ordinarily specialize less than the minor line wholesalers on the basis of buying groups to whom they sell. Major line wholesalers, for example, typically sell to more groups of buyers than minor line wholesalers; their customers include household consumers, a group to which minor line wholesalers do not sell.

Household buyers of fish seldom purchased at the "wholesale" price since the markup on sales price to them was higher in all cases than the markup of fish sold to other types of buyers. Wholesalers' sales to other wholesalers typically had the lowest markup. The markup on products sold to restaurants and institutions showed that two-thirds of the wholesalers marked up their products the same percentage to both groups, while one-third of those selling to both groups had a lesser markup on institutional sales than on restaurant sales. Among wholesalers who sold to both retail food stores and institutions, 55 percent had a lower markup on retail food store sales than on institutional sales. The remaining 45 percent had the same markup on sales to both groups.

All but one wholesaler employed the same percentage markup on fresh finfish and fresh shellfish. This is not to say that a wholesaler's markups were uniform among the different types of buyers. It means that there was no difference in the markup between fresh finfish and fresh shellfish in a given customer class for a particular wholesaler, with the exception of one distributor. Similarly, in nearly all instances the wholesalers also marked up their frozen finfish and frozen shellfish the same percentage within each customer class.

The similarity in markup reported on finfish and shellfish is an intriguing pricing policy since shellfish are higher value items which could presumably carry a proportionally higher markup than finfish. Two-thirds of the wholesalers handling both fresh as well as frozen fish marked up these products equally while one-third marked up fresh fish more than frozen fish. This, too, is interesting, considering the relative cost of handling fresh fish versus frozen fish. Lastly, nearly half of the distributors of canned fish marked up this item the same percentage as frozen fish, while the other half marked up canned fish less than frozen fish.

Table 2.—Percentage of wholesalers' sales by form of fish handled.

	Form of Fish								
	Whole or Processed				Prepared				Canned
Wholesalers	Fresh Finfish	Fresh Shellfish	Frozen Finfish	Frozen Shellfish	Fresh Finfish	Fresh Shellfish	Frozen Finfish	Frozen Shellfish	
Major Line ($N=3$)									
A-1	15%	5%	50%	18%	4%	1%	2%	5%	—
A-2	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
A-3	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
A-4	43	9	21	10	—	—	4	10	3%
C-1	—	—	30	40	—	—	30	—	—
C-2	25	20	35	10	—	—	—	10	—
C-3	—	—	18	6	—	—	8	3	65
C-4	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
C-5	42	28	6	3	5	2	5	4	5
C-6	—	—	10	85	—	—	—	—	5
C-7	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
C-8	10	66	5	2	—	—	6	11	—
C-9	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Composite % Sales[1]	17%	16%	22%	22%	1%	0%[2]	7%	5%	10%
Minor Line ($N=12$)									
A-5	—	—	—	12%	—	—	50%	38%	—
A-6	—	—	37%	10	—	—	12	40	1%
A-7	—	—	37	8	—	—	12	40	2
A-8	—	—	n.a.	n.a.	—	—	n.a.	n.a.	n.a.
A-9	—	—	—	—	—	—	—	—	100
A-10	—	—	7	6	—	—	75	10	2
C-10	25%	15%	20	35	—	—	—	5	n.a.
C-11	—	—	15	35	—	—	15	35	—
C-12	—	—	—	82	—	—	10	8	—
C-13	—	—	n.a.	n.a.	—	—	n.a.	n.a.	n.a.
C-14	—	—	—	—	—	—	85	15	—
C-15	—	—	—	n.a.	—	—	n.a.	n.a.	n.a.
Composite % Sales[1]	3%	2%	13%	21%	—	—	29%	21%	11%

n.a. = Not available.
[1] Composite or average percentage of sales is derived by totaling the percentage of sales in eash column and dividing by total number of respondents, i.e., eight for major line wholesalers and nine for minor line wholesalers.
[2] Actual figure is about one-third of one percent.
Source: Survey Data.

SOURCES OF SUPPLY

The sources of supply mentioned four or more times by the respondents are listed in Table 3. Not all sources are given in Table 3 since nine additional domestic sources and six foreign points of origin with fewer than four mentions have been omitted to conserve space. The sources listed, however, represent 80 percent of the total responses for domestic as well as foreign sources of supply.

Respondents identified their sources by city, state, region, province, or foreign country. Consequently, the sources in Table 3 are a mixture of geographic terms.

The contention that major line wholesalers draw their fish from more sources than minor line wholesalers is supported by the data in Table 3. Major line wholesalers identified an average of six domestic and four foreign suppliers whereas minor line wholesalers mentioned four domestic and two foreign sources per firm.

By rearranging the sources listed in Table 3, clear-cut geographic source patterns emerge. Domestically, New England's Boston and Gloucester are the basic sources of finfish. New York/Long Island, Philadelphia, and Baltimore in the Middle Atlantic region supply finfish as well as shellfish. The Gulf Coast states of Florida, Louisiana, and Texas provide mostly shellfish. California and Washington on the West Coast are the primary sources for canned fish. Lake Erie as well as other wholesalers in the Akron/Cleveland region represent freshwater fish sources.

Canada is by far the foreign source identified most often (60 percent of the mentions) for fresh and frozen saltwater as well as freshwater finfish. Mexico is a major supplier of frozen shellfish while Norway provides primarily canned fish. Denmark and Japan are also significant sources of frozen finfish and shellfish.

TRENDS IN WHOLESALE FISH SALES, 1966-1971

The sales trend for frozen fish from 1966 to 1971 is clearly upward for 22 of the 24 wholesalers who reported rising sales. The sales trend for fresh fish, however, increased for five wholesalers, but declined for six others. Several of the latter respondents emphasized that even though they were selling less fresh fish, their total revenue increased somewhat because the price per pound was substantially higher in 1971 and 1966. Canned fish

Table 3. — Sources of fish mentioned four or more times.

Sources	Form of Fish: Fresh — Ocean — Finfish, Maj	Fresh — Ocean — Finfish, Min	Fresh — Ocean — Shellfish, Maj	Fresh — Ocean — Shellfish, Min	Fresh — Lake Finfish, Maj	Fresh — Lake Finfish, Min	Frozen — Ocean — Finfish, Maj	Frozen — Ocean — Finfish, Min	Frozen — Ocean — Shellfish, Maj	Frozen — Ocean — Shellfish, Min	Frozen — Lake Finfish, Maj	Frozen — Lake Finfish, Min	Canned, Maj	Canned, Min	Subtotals Maj	Subtotals Min	Total
Domestic	Maj	Min	Maj	Min	Maj	Min	Maj	Min	Maj	Min	Maj	Min	Maj	Min	Maj	Min	
Boston	7	1	4				5	1	2	1			1		19	3	22
Florida	1		1	1			2		2	5					6	6	12
Texas			1						6	4					7	4	11
California													2	8	2	8	10
Gloucester	1						2	3		3					3	6	9
Baltimore	2		3				1		1				1		8		8
Cleve./Akron					2	1					1	2	1		4	3	7
Louisiana			1						3	2					4	2	6
Philadelphia				1			1	1	1	1	1				3	3	6
N.Y./Long Isl.	1	1	1					1		1			1		3	3	6
Lake Erie					2							3			2	3	5
Washington							1						1	3	2	3	5
Subtotal	12	2	11	2	4	1	12	6	15	17	2	5	7	11	63	44	107
Foreign																	
Winnipeg					5	1					4	3			9	4	13
Canada (not ident.)	1		1		1		3	3			3				9	3	12
Nova Scotia	4						3	3	1						8	3	11
Mexico									3	4					3	4	7
Norway							1						1	5	2	5	7
Denmark							3		1						4		4
Japan							1		2	1					3	1	4
Subtotal	5		1		6	1	11	6	7	5	7	5	1	5	38	20	58
GRAND TOTAL	17	2	12	2	10	2	23	12	22	22	9	8	8	16	101	64	165

sales of two-thirds of the reporting firms either exceeded or returned to the plateau they had attained prior to the Fall 1970 mercury scare. Minor line wholesalers typically reported the same trends as the major line wholesalers.

WHOLESALERS' EXPLANATIONS OF THEIR SALES TRENDS

The wholesalers' explanations of their sales trends were categorized as either supply or demand factors. On the demand side, for instance, wholesalers with greater fresh fish sales attributed the increase in sales to population growth, a rise in the income level of most families, greater recognition of fish's nutritional content, and the number of people who had become weight conscious. On the supply side, they attributed their company's rise in fresh fish sales to the fact there were fewer wholesalers handling fresh fish, as well as because restaurants were emphasizing fresh fish more as a menu item.

The demand for frozen fish was up, according to wholesalers, because it was easier to prepare than fresh fish, cheaper than most meat or fresh fish, or due to population growth, increased income, recognition of the nutritional value of fish, and the rise in the eating of fish to control weight. Among the supply factors, wholesalers emphasized that there was a better supply of frozen fish than fresh fish available, and the quality of frozen fish was equal to or better than fresh fish. They also attributed considerable growth to special promotional campaigns as well as to the emergence of drive-in restaurants that feature prepared frozen fish.

Only one respondent commented on the increase in canned sales. He attributed his sales increase to special promotional campaigns for canned fish. Any decline reported in the sale of fresh, frozen, or canned fish was generally blamed on the fear of pollution, the relaxation of Catholic dietary requirements, and/or increased prices. All of these factors influenced demand negatively.

PREFERENCES AS TO FRESH OR FROZEN FISH

Major line wholesalers are divided almost equally in their personal preference for handling fresh vs. frozen fish. Minor line wholesalers, however, unanimously prefer frozen fish. The major and minor line wholesalers who prefer frozen fish agree almost unanimously that other members of the channel of distribution (restaurants, institutions, retailers, and other wholesalers) prefer reselling frozen instead of fresh fish. Similarly, major line wholesalers who prefer handling fresh fish generally believe resellers within the structure of distribution want fresh fish in comparison with frozen fish. These data support the observations that: (a) the market for fish is segmented according to form of fish offered; (b) a majority of the wholesalers prefer handling frozen fish; and (c) the wholesalers tend to view their customers' preferences in terms of the form of fish they prefer handling.

REASONS FOR PREFERENCE

Wholesalers who personally preferred frozen fish did so primarily because it was easier to handle, there was no direct labor processing cost, and there was less waste or spoilage involved. They were unanimous in their opinion that restaurants and

institutions preferred frozen fish due to portion control, less spoilage, and ease of handling. Less waste or spoilage, ease of handling, and no direct labor processing cost were also the key reasons why these wholesalers thought retailers as well as other wholesalers preferred frozen fish. These reasons clearly point to convenience and, presumably, lower cost.

Rather than emphasize the convenience or implicit lower cost to the firm handling the product, wholesalers who prefer fresh fish typically mention such consumer or buyer oriented characteristics as the fact fresh fish tastes better, looks better, and discriminating consumers deserve fresh fish. Some wholesalers also mention that there is a higher profit with fresh than frozen fish. It should be pointed out, though, that few major line wholesalers handling both fresh and frozen fish reported that they actually mark up fresh fish more than frozen fish. Mark-ups differed by type of customer (restaurants cf. retail food stores), but within a given customer's category (i.e. retail food store) a particular distributor's markup on fresh and frozen fish is more likely to be the same than different.

BRANDING

A product represents not only a physical entity, but it also encompasses such elements as the package, label, and brand name associated with it.

Processors' brands are the brand names given to products for promotional purposes by their manufacturers or basic processors. When a reseller (wholesaler or retailer) attaches his brand name to the product, private brands, house brands, or reseller brands emerge.

Perishable fresh wet fish, of course, is unlike many other perishables when it comes to branding and the establishment of recognized brand names since it is purchased by consumers at the restaurant, institutional, and retail level by species rather than by processor's or reseller's brand name.

All major and minor line wholesalers with frozen fish sold a branded product. The branding policies of the major and minor line wholesalers differed, however; 12 of the 13 major line wholesalers handled frozen products branded by their processors. The thirteenth firm sold both processors' brands and frozen fish carrying his own firm's brand name. Among the minor line wholesalers, five handled processors' brands, while six featured their own brands along with processors' brands. Minor line wholesalers, consequently, were more likely to offer their own brand of frozen fish than major line distributors.

The brand pattern of canned fish is similar to that of frozen fish products in that none of the canned fish was sold unbranded. In addition, all major line wholesalers with canned fish sold processors' brands. Although most minor line wholesalers also sold only processors' brands, two minor line distributors offered both their own brands plus those of processors, while one firm concentrated solely on its own brand name of canned fish.

A substantial majority of wholesalers believe that customers prefer processors' brands to wholesalers' brands on fish. Similarly, no wholesaler thought additional branding would increase sales. This latter opinion is especially revealing because it contradicts the suggestion that fresh fish ought to be branded and promoted more aggressively by brand name.

PROMOTIONAL METHODS UTILIZED BY WHOLESALERS

The promotional methods used by wholesalers are categorized into four basic groups in Table 4. Total responses exceed the number of wholesalers surveyed because some wholesalers employed several promotional techniques.

Despite the fact sales promotional tools are accessible to all businesses, 23 percent of the major line wholesalers either took a dim view of promotion or did not recognize some of their sales activity as promotional in nature since they reported they engaged in "no promotion." A tally of the responses in Table 4 of major line wholesalers who engage in promotion shows 53 percent of the responses are positive inducements to resellers, 33 percent are essentially sales push techniques, while the remainder are direct mail advertisements to retailers or ads in the yellow pages. Nearly all wholesalers are listed in the yellow pages. They evidently did not consider this a means of stimulating sales, or they overlooked it.

Table 4.—Wholesale fish promotional methods.

Promotional Means	Wholesaler Groups and Number of Times Mentioned		
	Major Line	Minor Line	Total
Inducements to Resellers			
Offer a weekly special	3	2	5
Special price discount	3	6	9
Displays, ads, and allowances	5	4	9
Introductory offers, dinners	—	2	2
Pressure on Salesmen and Resellers			
Sales contests	1	1	2
Sales commissions	1	1	2
Telephone sales	5	1	6
Other Advertising Forms			
Bulletins/flyers to retailers	2	1	3
Yellow pages	1	—	1
No Promotion	3	5	8

Source: Survey Data

Table 4 further shows that 74 percent of the responses of minor line wholesalers are positive inducements to resellers, 21 percent are sales push methods and 5 percent are advertisements to retailers. Among the firms reporting promotional techniques, the minor line wholesalers mentioned positive inducements to resellers more often than major line firms (74 percent vs. 53 percent), and sales push techniques less often (21 percent vs. 33 percent).

Table 5.—Median pound orders and modal credit terms by customer class.

Wholesaler Groups	Customer Class: Restaurants Median Order lb	Restaurants Credit Terms	Institution Median Order lb	Institution Credit Terms	Retailers Median Order lb	Retailers Credit Terms	Other Wholesalers Median Order lb	Other Wholesalers Credit Terms
Major Line	50	30-day	62	30-day	175	7-day	850	30-day
Minor Line	48	30-day	63	30-day	250	cash	—	—

Source: Survey Data

MEDIAN SIZE ORDERS AND MODAL CREDIT TERMS

The typical size orders filled by wholesalers are given in Table 5 in terms of median dollar value. Median dollar value is used instead of the average dollar value because an extremely high or low dollar value will pull the average size order substantially upward or downward especially when the averages are based on a small number of observations. Unlike median size orders that are midpoints in an ascending sequence, the credit terms are expressed as modal values, that is, the credit terms that appear most frequently by customer class.

Looking at Table 5 from left to right, we see that the median size orders sold to restaurants as well as institutions by major line and minor line wholesalers are similar at 50 lb (cf. 48 lb) to restaurants and almost identical at 63 lb to institutions. Their 30-day modal credit terms are also identical to both customer classes. The median size orders of retailers differed substantially between the major line and minor line distributors. Contrary to what one might expect, the median size order of the minor line wholesalers at 250 lb exceeded that of major line wholesalers at 175 lb. Minor line wholesalers, nonetheless, tended to emphasize cash terms, whereas major line organizations offered seven days modal credit terms.

None of the minor line distributors sold to other wholesalers. For the major line wholesalers who did so, the median order was 850 lb with 30 days modal credit terms.

MARKET AREA SERVED AND DELIVERY TIME

Approximately one-half of the major line and one-third of the minor line wholesalers are local market distributors. That is, they ordinarily sell to customers within the greater Cleveland or Akron metropolitan areas. Another one-third of the minor line wholesalers operate within a radius of 60 to 70 miles from their establishment, whereas the second group of major line wholesalers (30 percent) cover an area 60 to 100 miles away. The last one-third of the minor line wholesalers serves customers 90 to 120 miles distant. Their group three counterpart among the major line wholesalers (15 percent) market fish throughout Ohio. One major line distributor sells to customers nationally.

These data show that a higher proportion of major line wholesalers are local market distributors and those selling beyond local markets serve larger market areas than the minor line wholesalers.

The time required to deliver orders to restaurants and institutions ranges from 4 to 48 hours for major and minor wholesalers. For orders delivered by major line wholesalers to retailers and other wholesalers, delivery time ranges from ½ day to 7 days. Minor line wholesalers' delivery time to retailers ranges from 1 to 3 days.

The modal delivery time is 24 hours to nearly all classes of customers by both groups of wholesalers. The suggestion that a 24-hour order/delivery service might increase sales has little relevance, consequently, since most resellers in the area surveyed already have such service.

FISH FABRICATING BY WHOLESALERS

Nearly 80 percent of the major line wholesalers add value to their products by changing their form in one manner or another, while minor line wholesalers, with the exception of one firm, sell their products without further fabrication or manufacturing.

The shortage and cost of qualified labor alluded to earlier, especially for major line wholesalers, is clearly related to their processing and/or preparation of fish. In fact several indicated that this is why they have stopped handling fish that requires processing. If this trend were to continue, primary coastal wholesalers and manufacturers would obviously find themselves doing more processing.

By form of fish purchased, two-thirds of the minor line wholesalers and one-seventh of the major line wholesalers emphasize prepared fish in their product mix, whereas only four-sevenths of the major line wholesalers purchase predominantly processed fish. Only two firms in this group put most of it in prepared form for resale. Whole fish, on the other hand, is the major form of fish procured by two-sevenths of the major line firms. All of these firms primarily process their whole fish rather than process and prepare it.

SPOILAGE

Overall, 10 of the 11 wholesalers handling fresh fish indicated they had a spoilage problem. To overcome the problem, they handled fresh fish on a rapid turnover basis, frequently iced and delivered it, froze any surplus in danger of spoiling, or de-emphasized

Cyril Loger (left) and Albert Machamer (right), members of the research team at Kent State University, talk with Wayne A. Sheffler (center), institutional food manager.

fresh fish by offering more frozen fish to their customers. When asked how suppliers could aid in preventing spoilage, six of the ten respondents said suppliers were already doing all they could. The other four, however, thought suppliers ought to ice the fish fully, utilize better packaging, and ship more frequently.

Despite the fact wholesalers asserted in the forepart of the questionnaire there were no problems in handling frozen fish, eight of the 24 with frozen fish reported there were spoilage problems. To handle frozen fish effectively they not only had to install special freezers in their plant and on their trucks to eliminate thawing, but they also had to rotate inventory carefully to control dehydration. Four firms suggested that suppliers control their goods in transit more carefully to eliminate thawing. Two others thought code dating would help in rotating their inventory.

OTHER PROBLEMS (NONSPOILAGE)

Five of the 11 wholesalers offering fresh fish identified other (nonspoilage) problems in handling fresh fish. Two mentioned the high cost of direct labor in processing fish, but offered no suggestions to resolve the problem. Three wholesalers were concerned about inadequate supply as well as the transportation and poor quality of fresh fish. One respondent thought the supply should be increased by offering more inducements to fishermen. Compulsory inspection and grading was suggested as a means of improving quality, while faster movement of fresh fish to inland distributors was proposed to overcome the transportation problem.

Eight of the 24 wholesalers selling frozen fish noted other (nonspoilage) problems. Six of the eight mentioned breakage and/or poor quality. One thought packaging was poor, while another said retailers handled frozen fish incorrectly, thereby letting it thaw. To control breakage and/or poor quality, the wholesalers suggested: a) processor's improve their quality control program; b) those handling the product in transit do so more carefully; and c) quality standards and compulsory grading of foreign and domestic fish be adopted. Better, stronger packages would obviously resolve the packaging problem. To prevent thawing of frozen fish in open refrigerator cases in retail stores, the frozen fish should be stocked in the bottom of the case.

UNDERUTILIZED SPECIES

Because popular species of fish are either depleted or shielded from depletion by international harvesting quotas, lesser known species must be utilized if the sea is to provide additional protein for people. In order to determine the marketability of such fish, a list of 13 underutilized species was shown to the wholesalers. The list was drawn up with the aid of the persons associated with Market Research and Services Division, National Marine Fisheries Service. Wholesalers were asked: 1) if they recognized each species; 2) whether or not they could sell it profitably; and 3) their reasons for not handling the fish.

Silver hake, pollock, and mackerel were familiar to all respondents. Sea herring, northern shrimp, and butterfish, in turn were also familiar to all but a few respondents. The least familiar species were Pacific cod, white hake, skate, dogfish, tanner crab, calico scallops, and ocean quahog. If the nonrespondents were such due to lack of recognition of the species, approximately 50 percent of the wholesalers were unfamiliar with the latter species.

Silver hake and mackerel are the two species that over 50 percent of the respondents report they can sell profitably. Lack of consumer demand is the prime reason given by wholesalers for not handling the underutilized species. The unfavorable characteristics of some of the species is reported as the second reason, although far below the prime reason (lack of demand), according to number of times mentoned. While wholesalers are willing to handle a species if profitable, they appear reluctant to popularize the underutilized species and thus make them profitable.

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MFR PAPER 1007

Sonic Tags in Sockeye Salmon, *Oncorhynchus nerka*, Give Travel Time Through Metropolitan Waters

KENNETH L. LISCOM

INTRODUCTION

Sonic tags were inserted in the stomachs of sockeye salmon returning from the Pacific Ocean to a large lake (3 x 30 km; 80 m deep) adjacent to Seattle, Wash. These fish contribute to a growing sport fishery, and State officials were concerned with their rates of travel through the waters of a metropolitan area. Their travel route lay between Puget Sound and Lake Washington, a distance of about 10.5 km.

From initial plantings in the 1930's, returns of sockeye salmon to Lake Washington rose from a few thousand fish to well over the 100,000 level in the past several years. In 1971, estimates placed the returns at approximately 250,000 fish.

To enter the lake from Puget Sound, fish must travel through the Lake Washington Ship Canal (Figure 1), including parts of Lake Union. Because the Canal is a relatively shallow passageway, surrounded by heavy industrial and urban development, the Washington State Department of Fisheries (WDF) was concerned that the migration of the fish might be delayed or subjected to harmful environmental conditions.

To determine travel time of the sockeye salmon from the Hiram M. Chittenden Locks into Lake Washington, a study was made in the summer of 1971 by the Northwest Fisheries Center, National Marine Fisheries Service, in cooperation with WDF.

Kenneth L. Liscom is a member of the staff of the Northwest Fisheries Center, National Marine Fisheries Service, NOAA, 2725 Montlake Blvd. E., Seattle, WA 98112

EQUIPMENT AND PROCEDURES

Migration paths and travel rates of fish were determined by means of a sonic tag placed in the stomach. The tag had a high-frequency sound transmitter that operated on a carrier frequency of 70 kHz. The transmitter was battery-powered with a transmitting life of 3 weeks. Transmitter and battery were sealed in a plastic capsule 73 mm long and 19 mm in diameter (Figure 2A). The tag emitted a pulse-coded signal; thus, a number of tags (and fish) could be individually identified.

Tag signals were monitored from an open boat (with a portable hydrophone and receiver (Figure 2B)) and by fixed recording monitors on shore. The receiver was a self-contained unit that amplified the signal from the hydrophone and converted it to an audible tone. By rotating the directional hydrophone in the water, while listening for the loudest tone, the operator could determine the direction of the tagged fish from his position. Directional ranges of 1.6 km (1 mile) could be obtained with the hydrophone.

Tagged fish approaching within range of fixed shore monitors were automatically detected and their presence was recorded on tape. A fixed monitor station consisted of a receiver-tapedeck unit on shore connected to two hydrophones placed in the water. By proper placement of the pair of hydrophones under water, the direction in which the fish were travelling could be determined and recorded. Time reference marks were recorded on the tape to provide a chronological record on the entry and departure of the fish at specific areas.

Three shore-based recording monitors were used to determine timing of sockeye salmon between the locks and Lake Washington (Figure 1). In addition, nine fish were individually tracked to determine their patterns of movement between monitors, located at three points:

(1) in the Fremont cut (3.7 km from Locks),

(2) under the Interstate 5 Freeway bridge (7.1 km from Locks), and

(3) at the east end of the Montlake cut (9.0 km from Locks).

Each monitor was serviced daily, at which time the used portion of the recording tape was removed and interrogated.

Three groups of five sockeye salmon were tagged with sonic tags and released. For identification of individual fish, each tag within a group transmitted at a different pulse rate. Once a group was released, the fish were monitored until all had passed the study area, after which a subsequent group was released.

Fish for study were captured by WDF personnel with a purse seine fished in salt[1] water below the dam at the Chittenden Locks. After the fish were tagged, they were transported and released immediately above the dam into the fresh[1] water of the Lake Washington Ship Canal.

[1] Some mixing of fresh with salt water undoubtedly occurs below the dam, with the reverse applying in the area immediately above the dam due to frequent lockages. Essentially, water below the dam is predominantly salt, whereas that immediately above is primarily fresh.

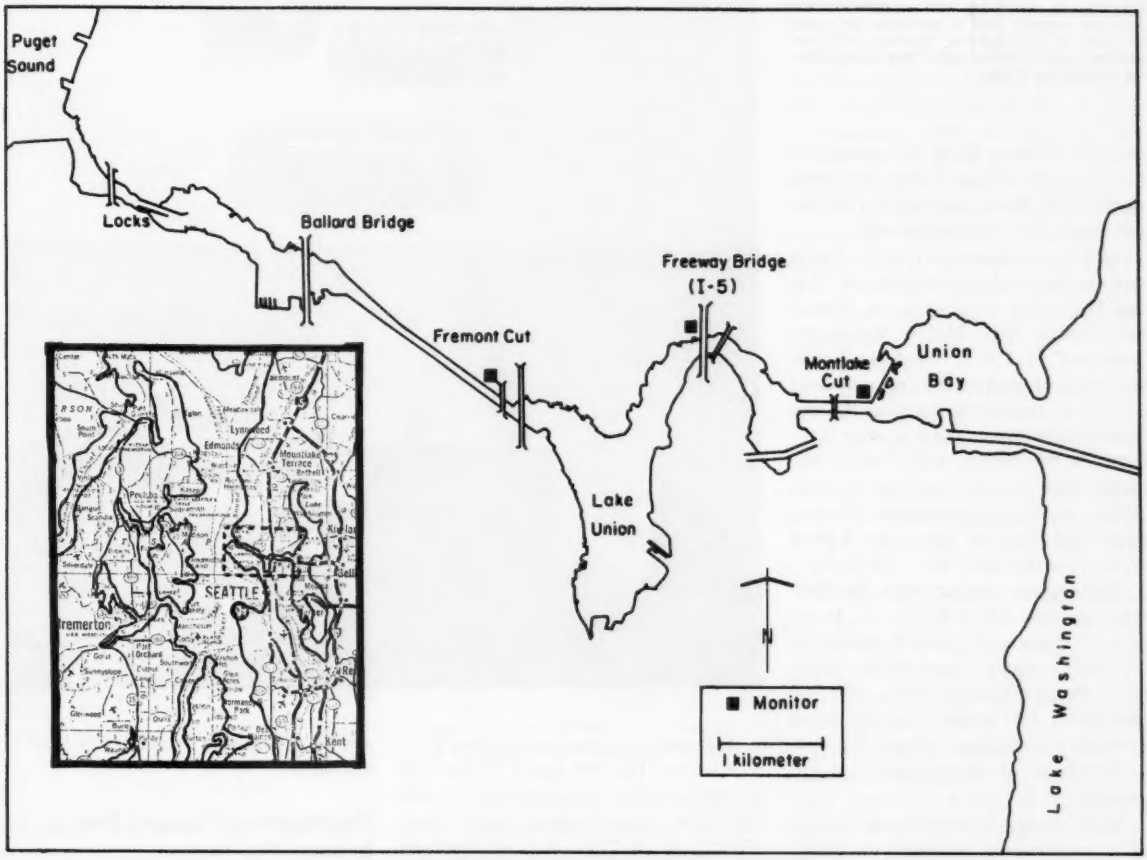

Figure 1.—Lake Washington Ship Canal: Puget Sound to Lake Washington.

Following release, the first fish to begin moving away from the lock area was tracked either until it entered Lake Washington, or until nightfall. Tracks interrupted by darkness were resumed at dawn the following day. As each tagged fish entered the lake, the tracker would return to the ship canal and locate the next fish coming through and proceed to track it. Remaining tagged sockeye were tracked from time to time to check their progress. This procedure was repeated until all fish had reached Lake Washington. Surveys of Lake Washington were also made to determine the distribution of tagged fish.

During the interval between the second and third tag releases, we tagged one sockeye salmon with a thermal (temperature-sensitive) tag and released it directly into Lake Washington. This gave us an opportunity to observe the depths and temperature ranges of the water. Temperature data received from the tag were correlated with the lake's temperature profiles.

RESULTS

Five sonic-tagged sockeye salmon were released on each of the following dates—July 6, 13, and 27, 1971. The average size of the tagged fish was 58.4 cm (23 inches fork length). Passage times for the fish of the three groups are shown in Table 1.

Travel Patterns

Basically, the pattern of travel for the first two groups was the same. The fish hesitated at the locks but, once on their way, tended to move steadily (except for periods of darkness), keeping primarily to the north shore.

During the third tracking period (27 July), the fish delayed in two areas: (1) between the locks and Ballard Bridge (1.5 km from the locks) and (2)

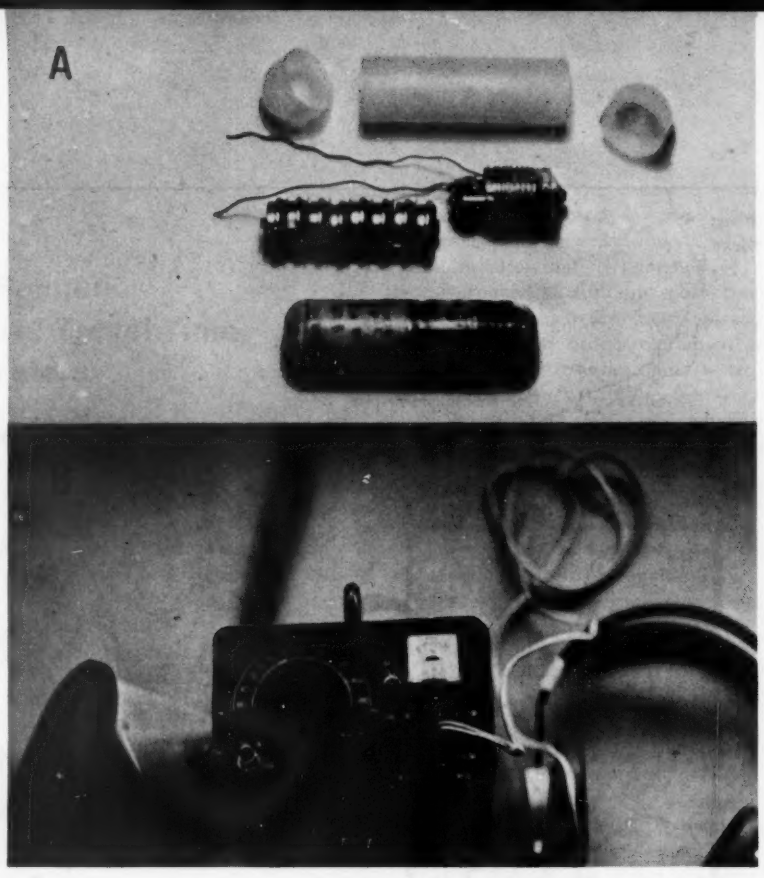

Figure 2.—A. Sonic tag with components outside the capsule and a packaged tag ready for use. B. Hydrophone, receiver, and earphones used to locate sonic tags when tracking salmon from a boat.

in Lake Union. Many fish were seen jumping and rolling in these two areas during the third tracking period but not during the first two periods.

Water temperatures were higher during the third tracking period (Figure 3). Surface temperature at time of fish capture was 13.4°C below the locks and 21.1°C above. Lake Union surface temperatures reached a peak of 23.4°C during the third period. Surface temperatures taken on 8 July were 11.7°C below the locks; 16.2°C above the locks; and 17.2°C in Lake Union. While surface temperatures became quite high later in July, the bottom areas remained fairly cool (14°C).

The sockeye salmon with the thermal tag was followed for 12 hours and 45 minutes in Lake Washington. This fish remained north of the Evergreen Point Floating Bridge, moving east about 200 meters past the draw span and then back to Webster Point — a movement of approximately 4 km overall.

Mean depth occupied was 8.2 m in a temperature stratum of 15°C; vertical movement ranged from the surface to 17.1 m. Maximum depths in the area traversed were from 51.2 to 63.4 m. The fish spent 82 percent of the recorded time between 5 and 10 m in a temperature layer from 13.4°C to 16.7°C. It was observed ascending to the surface on four occasions; movement to the surface and to depth was completed within a few seconds.

Table 1.—Passage times for sonic-tagged sockeye salmon traveling from Hiram M. Chittenden Locks to Lake Washington, 1971.

Group and date	Tag code	Ingress to Lake Washington		Total passage time		
		Date	Time	Days	Hours	Minutes
I, 6 July	1	7-6	1900	—	8	—
	2	7-6	1945	—	8	45
	4	7-7	0600	—	19	—
	3	7-7	1200	1	1	—
	5	7-7[1]	—	—	23	+
II, 13 July	3	7-14	0610	—	20	26
	1	7-14[2]	—	1	+	+
	5	7-14[2]	—	1	+	+
	2	7-15	0930	1	23	46
	4	7-15	1715	2	7	31
III, 27 July	1	—	—[3]	—	—	—
	2	7-29	1720	2	6	40
	3	8-4	1545	8	5	5
	5	8-7	1445	11	4	5
	4	8-14	0230	17	15	50

[1] Not recorded on Montlake cut monitor tape (probably obscured by boat motor noise). Date of passage estimated from data on the monitor below Freeway Bridge.
[2] Not recorded on Montlake cut monitor. Time estimated from data on the monitor below Freeway Bridge.
[3] Tag malfunctioned immediately after release.

Distribution of Tagged Fish In Lake Washington

Three surveys were made of fish distribution in Lake Washington (Figure 4). On 9 July, the lake north of the Evergreen Point Bridge was

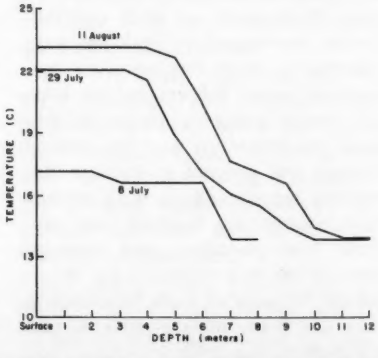

Figure 3.—Water temperatures and depth in Lake Union, 1971.

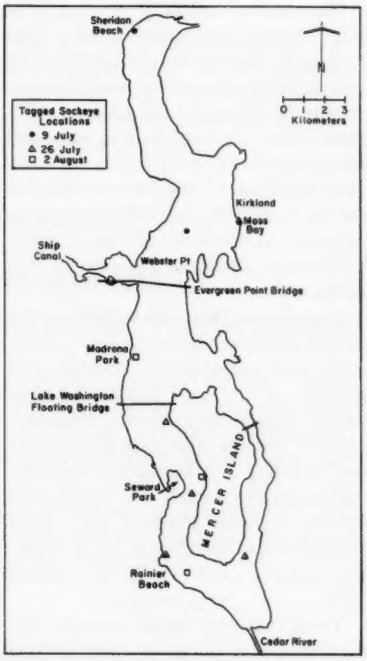

Figure 4.—Locations of tagged sockeye salmon during three surveys (9 July, 26 July, and 2 August 1971) in Lake Washington.

searched and three fish with sonic tags were found:

(1) 2 km offshore and west of Kirkland, Washington (mid-lake and approximately 3 km north of the Evergreen Point Bridge),

(2) 90 m offshore from Moss Bay at Kirkland, and

(3) 15 m off extreme northwest shore of Lake Washington (Sheridan Beach), approximately 11 km north of the Evergreen Point Bridge. Fish found in the 9 July survey were all from the initial group, tagged and released above the locks on 6 July.

Four tagged fish were located on 26 July when the lake area was searched south of the Evergreen Point Bridge:

(1) west shore of Mercer Island about 6 km south of the Evergreen Point Bridge,

(2) about mid-lake 9 km south of the Evergreen Point Bridge and off Baily Point (Seward Park),

(3) about 90 m off west shore of Lake Washington, 12 km south of the Evergreen Point Bridge in the Rainier District, and

(4) about 450 m off southeast tip of Mercer Island in the east channel.

Tagged fish at locations (1) and (4) had the same code, which indicated one of the tags was from the 6 July tagging. The north end of the lake was not surveyed on 26 July.

On 2 August, the entire lake was surveyed and three tagged fish were found in the southern area (south of the Evergreen Point Bridge):

(1) 30 m offshore from Madrona Park (about midway between the two Lake Washington floating bridges),

(2) 15 m off west shore of Mercer Island (approximately mid-island), and

(3) 1 km off southwest tip of Mercer Island.

No tagged fish were found in the northern part of the lake. While some of these fish may have been tagged earlier, it is more likely that all the tagged fish located during the third survey came from the 27 July tagging.

SUMMARY

Rate of movement of sockeye salmon through the Lake Washington Ship Canal appeared related to time of migration. Early in July, the fish moved without delay from the Hiram M. Chittenden Locks into Lake Washington. By mid-month they were still moving well but showed a tendency to slow down. At the end of July and in early August, a pronounced delay in movement was noted, with the fish holding in two locations:

(1) between the Locks and the Ballard Bridge, and

(2) in Lake Union.

All fish tracked favored the north shore. Movement through the Fremont cut and Montlake cut was steady and fairly rapid.

Surface temperatures in Lake Union increased from 17.2 to 23.4°C from 6 July to 11 August. Temperatures at 6 m increased from 16.7 to 20.6°C, and those at or near the bottom (7-12 m) remained at 13.9°C.

One sockeye salmon, carrying a temperature-sensitive tag, moved at a mean depth of 8.2 m; it favored a stratum of 15.0°C. Several rapid movements to the surface and return to depth were observed.

Limited surveys of Lake Washington indicated that the distribution of tagged fish was widespread, especially early in the run when tagged fish were found in the north end of the lake. The tendency, however, was for the fish to concentrate in the south end of the lake in the vicinity of Cedar River, the principal sockeye spawning stream entering Lake Washington.

MFR Paper 1007. From Marine Fisheries Review, *Vol. 35, No. 9, 1973. Copies of this paper, in limited numbers, are available from D83, Technical Information Division, Environmental Science Information Center, NOAA, Washington, DC 20235.*

NOAA/NMFS Developments

U. S. Restricts Fish Oil, Meal, Solubles Exports

The Secretary of Commerce, in early July, announced that various categories of agricultural commodities, including fish meal, fish solubles, and hydrogenated fish oil are subject to export controls, and all producers of these products will be substantially restricted in selling these products to higher priced foreign markets.

According to the ruling, none of these commodities can be exported without validated license from the Department of Commerce's Office of Export Control. Licenses will be granted on the following basis:

1. Orders accepted on or before June 13, 1973, for export prior to October 1, 1973, will be licensed to the extent of 100 percent of the unfilled balance of the order.
2. Orders accepted after June 13, 1973, for export prior to October 1, 1973, will not be licensed until further notice. A method of licensing such orders will be announced on a later date.
3. Orders accepted for export on or after October 1, 1973, will not be licensed until further notice.

These fishery products were put under export controls to close the loophole in the previously imposed export controls of high-protein feed.

Substantial increase in foreign demand for high-protein feed, such as fish meal, has been caused by the export restrictions on soybeans, soybean meal, cottonseed, and cottonseed meal. Traditionally, United States production of fish meal provides only about half of the total meal in this country; the other half being imported, mainly from Peru.

Concerning fish oil, only hydrogenated fish oil is under export control. Exports of hydrogenated fish oils are negligible in comparison with exports of other fish oils. Menhaden and other fish and marine mammal oil are not subject to control.

About 85 percent of United States produced fish oils are exported (latest 5-year average) and command a relatively high price because they are used for margarine and shortening production outside the United States. The use of fish oils for food purposes is not allowed in the United States, and their major use is as raw material for protective coatings and other industrial purposes; their exports do not affect the feed situation in the United States.

Foreign Fishery Developments

Canada Joins ICNAF Fishing Check Scheme

Canadian fishery protection officers started checking nets and catches aboard foreign fishing vessels in the north Atlantic in July to enforce international conservation regulations.

The inspections are part of an International Commission for the Northwest Atlantic Fisheries (ICNAF) Scheme of Joint International Inspection entered by Canada July 1. Canadian fisheries officials view participation in the scheme as an opportunity to protect fishery resources from overexploitation.

In joining the ICNAF scheme, Canada is permitted to board and inspect nets and catches of most of the foreign vessels fishing off the east coast. Ten other ICNAF member countries are already participating, although one, the Soviet Union, permits inspection of catches on deck, but not below decks. The scheme requires Canadian fishing vessels to submit to inspection by inspectors of other participating countries.

Regulations enforced by the joint international inspection scheme deal with such requirements as catch quotas and national allocations, area closures, size limits of certain fish species, minimum mesh sizes of fishing nets and maintenance of daily catch records. Any breaches of regulations detected during inspections are reported to government authorities of the country concerned which is responsible for prosecutions.

Inspections are conducted under established procedures, details of which have been circulated to masters and owners of all east coast Canadian fishing vessels. Each country designates specific officers and vessels to carry out boarding and inspection missions. All inspection vessels are required to fly the ICNAF Pennant and when an inspection boarding is to be made, the International Code of signals SQ3.

Three fisheries patrol vessels, the *Cape Freels* based at St. John's, New Foundland, and the *Chebucto* and *Cygnus*, based at Halifax, Nova Scotia, and 22 fishery protection officers are authorized at present to conduct Canadian inspections. The *Cape Freels* and the *Chebucto* were equipped earlier this year with necessary boarding facilities to carry out these duties.

ICNAF member nations now participating in the scheme are: Canada, Federal Republic of Germany, France, Norway, Japan, Poland, Portugal, Spain, the Soviet Union, the United Kingdom and the United States.

South Korea Plans Surinam Shrimping

Following the completion of six 120-foot shrimp trawlers now under construction in the United States, a South Korean fishing company will begin shrimping out of Paramaribo, Surinam, according to the National Marine Fisheries Service. Reportedly, Marubeni Corporation of Japan will market the catch after it is processed by a U.S.

firm based in Surinam.

The entry of South Korean shrimping vessels into these waters is seen as a significant step. The Japanese currently are reported to be operating 47 vessels out of Paramaribo.

Publications

Recent NMFS Scientific Publications

NOAA Technical Report NMFS CIRC-381, Thorson, Lee C., and Mary Ellen Engett, **"Fishery publications, calendar year 1967: lists and indexes,"** July 1973, iv+22 p. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. Price: 35 cents.

ABSTRACT

The following series of fishery publications of the National Marine Fisheries Service, National Oceanic and Atmospheric Administration (until October, 1970 the Bureau of Commercial Fisheries of the U.S. Fish and Wildlife Service) in calendar year 1967 are listed numerically (with abstracts) and indexed by author, subject, and geographic area: Circular, Data Report, Fishery Industrial Research, Fishery Leaflet, and Special Scientific Report—Fisheries.

NOAA Technical Report NMFS CIRC-382, Engett, Mary Ellen, and Lee C. Thorson, **"Fishery publications, calendar year 1966: lists and indexes,"** July 1973, iv+19 p. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. Price: 35 cents.

ABSTRACT

The following series of fishery publications of the National Marine Fisheries Service, National Oceanic and Atmospheric Administration (until October, 1970 the Bureau of Commercial Fisheries of the U.S. Fish and Wildlife Service) in calendar year 1966 are listed numerically (with abstracts) and indexed by author, subject, and geographic area: Circular, Data Report, Fishery Industrial Research, Fishery Leaflet, and Special Scientific Report—Fisheries.

NOAA Technical Report NMFS CIRC-383, Thorson, Lee C., and Mary Ellen Engett, **"Fishery publications, calendar year 1965: lists and indexes,"** July 1973, iv+12 p. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. Price: 30 cents.

ABSTRACT

The following series of fishery publications of the National Marine Fisheries Service, National Oceanic and Atmospheric Administration (until October, 1970 the Bureau of Commercial Fisheries of the U.S. Fish and Wildlife Service) in calendar year 1965 are listed numerically (with abstracts) and indexed by author, subject, and geographic area: Circular, Data Report, Fishery Industrial Research, Fishery Leaflet, and Special Scientific Report—Fisheries.

Monthly Fishery Market Review

Groundfish Supplies Up, Blocks Down in May

GROUNDFISH FILLETS

Total supplies of major groundfish fillets (Tables 1-5) in May were well above a year ago as a result of higher May 1 inventories and heavier imports during the month. Although consumption during May was above the same month in 1972, it declined sharply from April. Consumption in May was off more than seasonally, given the adequacy of supplies this year and the fact that prices have declined somewhat (Table 6).

There appears to be a growing tendency for the industry to hold greater quantities of supply in inventory this year. By the end of May, inventories of fillets were three times larger than last year. Among the major reasons for this new inventory strategy are the following:

1. Although fillet imports are more abundant this year (up 24 percent during January-May, compared with last year), the higher cost of imports stemming from dollar devaluation and strong demand may be more difficult to recoup under regulations of the President's new economic policies. Some processors and dealers may have been holding higher-cost product awaiting relaxation of pricing guidelines.
2. In addition, a major impetus toward stockpiling of supplies could be related to *anticipated* higher costs and tightening supplies. There is increasing interest among major U.S. supplying nations in European markets as outlets for supplies traditionally destined for the United States. With this attitude pervading the markets, many U.S. processors may be trying to hedge against future supply difficulties and price competition with other foreign buyers by purchasing heavily now.
3. By the end of May, inventories of fillets in the United States were three times larger than last year, and sufficient to support at least one month's consumption without additional new supplies (i.e., imports). U.S. purchasers may be attempting to build inventories to a level at which they can exert more bargaining power in price negotiations with foreign suppliers. U.S. purchasers could be attempting to make themselves less subject to the dictates of a seller's market by increasing their stock-to-consumption ratios.

BLOCKS, STICKS AND PORTIONS

The market picture for fish blocks in May was characterized by short

supplies and soaring prices. Since January, holdings of blocks (Table 7) have been on the decline as producers were making heavy withdrawals, necessitated by a 24 percent reduction in imports. As of June 1, cold storage holdings of blocks were a little more than half of last year's level and down from a month earlier. The situation with cod blocks was particularly severe, with holdings at only 40 percent of last year's level. Cold storage holdings of blocks traditionally increase from May thru November, in preparation for heavy fourth quarter production of sticks and portions. Production has been running ahead of last year, however, with no immediate prospect for improvement in block supplies, the outlook for continued heavy production is bleak.

Imports of fish blocks have dropped sharply, and prices (Table 8) have risen for several reasons, among which are:

1. Production of groundfish blocks, especially cod, has been below last year in most of the major supplying nations. The reason is twofold:
   a. Cod catches have been off in Canada, Iceland, Denmark, and Norway.
   b. Many of these nations have been processing a greater percentage of available cod into fillets instead of blocks since last year.

   This last point deserves further explanation. The shift towards fillets last year was tied to price differentials between the two product forms. Cod block prices were unusually stable in 1972, the result of high U.S. inventories and relatively good production abroad. While block prices were running at a fairly even keel, fillet prices were advancing. Many foreign suppliers apparently shifted production to fillets when the margin separating them from cod blocks widened, favoring their more profitable manufacture. However, in 1973, the price situation reversed. Greater production of fillets abroad, encouraged by high prices last year, created strong demand pressure on the resultant shorter supplies of blocks. Block prices began to skyrocket in January. By March, the price advantage to producing fillets as opposed to blocks was nearly erased. This sudden shift in the market was apparently unforeseen by many foreign producers, who continued to direct fish supplies into fillet manufacture. Thus, by May, U.S. sticks and portions producers were faced with precariously low block inventories and little hope, in the short run, that currently high block prices would attract greater quantities of raw material.

Prices of cod fillets and cod blocks (1-lb packages of frozen fillets), January 1972-June 1973.

Item	JAN	FEB	MAR	APR	MAY	JUN
	Cents per pound					
1972						
Cod fillets	50.0	53.5	56.5	56.0	56.0	56.0
Cod blocks	46.5	47.0	47.0	47.0	46.0	47.0
Margin	3.5	6.5	9.5	9.0	10.0	9.0
1973						
Cod fillets	56.5	57.0	57.5	61.0	62.0	65.5
Cod blocks	48.0	50.5	56.0	59.0	60.0	66.5
Margin	8.5	6.5	1.5	2.0	2.0	-1.0

2. Block prices have increased sharply since January for the following reasons:
   a. U.S. dollar devaluation, which has made the price of imported blocks higher to U.S. purchasers.
   b. And, increased international competition for available block

Table 1.—Groundfish (fillet weight, in million pounds) supplies, May 1973. Groundfish include cod, flounder, haddock, and ocean perch.

	MAR	APR	MAY	MAY	Percent Change	JAN-MAY	JAN-MAY	Percent Change
	1973	1973	1973	1972		1973	1972	
	Million Pounds				*Percent*	*Million Pounds*		*Percent*
Beginning Inventory	44.4	34.5	31.6	14.2	+123	52.4	45.1	+ 16
Landings, Total	5.5	5.7	6.7	7.2	− 7	26.8	28.4	− 6
Imports	24.8	25.5	25.4	17.6	+ 44	114.2	92.3	+ 24
Total Supply	74.7	65.7	63.7	39.0	+ 63	193.4	165.8	+ 17
Ending Inventory	34.5	31.6	34.5	14.9	+132	34.5	14.9	+132
Consumption	40.2	34.1	29.2	24.1	+ 21	158.9	150.9	+ 5

Table 2.—Cod (fillet weight, in million pounds) supplies, May 1973.

	MAR	APR	MAY	MAY	Percent Change	JAN -	MAY	Percent Change
	1973	1973	1973	1972		1973	1972	
	Million Pounds				*Percent*	*Million Pounds*		*Percent*
Beginning Inventory	15.5	13.1	13.6	5.5	+147	16.2	6.2	+161
Landings, Total	1.0	1.4	1.8	1.3	+ 38	6.1	6.1	—
Imports	9.2	10.7	6.4	9.4	− 32	39.3	38.9	+ 1
Total Supply	25.7	25.2	21.8	16.2	+ 35	61.6	51.2	+ 20
Ending Inventory	13.1	13.6	14.7	7.5	+ 96	14.7	7.5	+ 96
Consumption	12.6	11.6	7.1	8.7	− 18	46.9	43.7	+ 7

Table 3.—Flounder (fillet weight, in million pounds) supplies, May 1973.

	MAR	APR	MAY	MAY	Percent Change	JAN -	MAY	Percent Change
	1973	1973	1973	1972		1973	1972	
	Million Pounds				*Percent*	*Million Pounds*		*Percent*
Beginning Inventory	6.7	6.0	5.2	3.0	+ 73	8.6	9.3	− 8
Landings, Total	2.1	2.2	2.9	3.0	− 3	11.4	12.2	− 7
Imports	8.0	7.3	7.3	4.7	+ 55	36.0	24.0	+ 50
Total Supply	16.8	15.5	15.4	10.7	+ 44	56.0	45.5	+ 23
Ending Inventory	6.0	5.2	6.0	2.8	+114	6.0	2.8	+114
Consumption	10.8	10.3	9.4	7.9	+ 19	50.0	42.7	+ 17

supplies. As in the case of fillets, traditional U.S. block suppliers are viewing European markets as attractive outlets for their product. This is partially related to the world currency situation which, in some instances, has made the price of blocks offered in Europe as attractive as, if not more than, in the U.S.-market. The U.S. position, when bidding for world block supplies, has progressively worsened in favor of nations with higher valued currencies.

SHRIMP

Supplies of shrimp (Table 11) during May were below the previous year, as both landings and imports were below the previous year. Landings were well below those in 1972 in all areas except the Pacific. Although May landings in the Gulf were off 43 percent from 1972, it must be remembered that the shrimp season in Louisiana was delayed this year as a result of the floods in that area. Preliminary indications, however, show that the June Gulf catch was about equal to that in 1972. It thus appears that the large quantities of fresh water flowing into the bays have not had a permanent effect on this year's shrimp crop.

Imports of shrimp apparently continue to be affected by the purchases by the Japanese. The Japanese increased their imports of shrimp by about 31 percent in April and have imported 10 percent more during the first 4 months of the year. U.S. imports were 35 percent below the previous May, and 11 percent below the first 5-month total.

Prices on the ex-vessel and wholesale levels continued to rise through May (Table 12) and were near or at record levels during the month. This reflects the increasing tight supply situation and the relatively high demand. In spite of these high prices, consumption was high during the month, although below the previous year. The quantity consumed during January-

Table 4.—Haddock (fillet weight, in million pounds) supplies, May 1973.

	MAR	APR	MAY	MAY	Percent Change	JAN -	MAY	Percent Change
	1973	1973	1973	1972		1973	1972	
	Million Pounds				*Percent*	*Million Pounds*		*Percent*
Beginning Inventory	11.6	9.5	8.3	2.3	+261	9.8	8.9	+ 10
Landings, Total	0.3	0.3	0.3	0.5	− 40	1.4	1.9	− 26
Imports	5.0	3.0	3.6	2.2	+ 64	17.3	11.0	+ 57
Total Supply	16.9	12.8	12.2	5.0	+144	28.5	21.8	+ 31
Ending Inventory	9.5	8.3	8.3	1.8	+361	8.3	1.8	+361
Consumption	7.4	4.5	3.9	3.2	+ 22	20.2	20.0	+ 1

Table 5.—Ocean perch (fillet weight, in million pounds) supplies, May 1973.

	MAR	APR	MAY	MAY	Percent Change	JAN -	MAY	Percent Change
	1973	1973	1973	1972		1973	1972	
	Million Pounds				*Percent*	*Million Pounds*		*Percent*
Beginning Inventory	10.6	5.9	4.5	3.4	+ 32	17.8	20.7	−14
Landings, Total	2.1	1.8	1.7	2.4	− 29	7.9	8.2	− 4
Imports	2.6	4.5	8.1	1.3	+523	21.6	18.4	+17
Total Supply	15.3	12.2	14.3	7.1	+101	47.3	47.3	—
Ending Inventory	5.9	4.5	5.5	2.8	+ 96	5.5	2.8	+96
Consumption	9.4	7.7	8.8	4.3	+105	41.8	44.5	− 6

Table 6.—Groundfish prices, May 1973.

	MAR	APR	MAY	MAY	Percent Change	JAN-MAY	JAN-MAY	Percent Change
	1973	1973	1973	1972		1973	1972	
	Cents Per Pound				*Percent*	*Cents Per Pound*		*Percent*
COD:								
Ex-vessel[1]	24.3	20.0	13.1	13.9	− 6	21.2	21.2	—
Wholesale								
1 lb Canadian	57.9	61.5	62.0	56.0	+11	59.0	54.4	+ 8
5 lb Canadian	53.3	58.0	59.6	55.8	+ 7	54.3	53.5	+ 2
Retail[2]	184.5	184.0	174.5	124.0	+41	181.6	132.6	+37
FLOUNDER:								
Ex-vessel[3]								
Yellowtail	28.85	32.87	18.30	19.49	− 6	26.43	20.38	+30
Lemonsole	53.15	44.00	24.84	27.92	−11	44.44	40.25	+10
Greysole	36.30	29.40	19.08	20.68	− 8	31.09	26.99	+15
Blackback	32.15	30.05	17.91	18.28	− 2	28.60	29.95	− 5
Wholesale								
5 lb. domestic	97.5	111.3	95.7	89.0	+ 8	97.6	86.4	+13
5 lb. Canadian	79.1	80.5	80.2	59.7	+34	79.2	56.3	+40
Retail[2]	225.7	236.6	224.0	161.0	+39	213.8	160.4	+33
HADDOCK:								
Ex-vessel[1]								
Large	47.10	49.7	44.5	38.0	+17	46.0	41.5	+11
Scrod	27.16	32.5	32.2	34.7	− 7	29.2	34.7	−15
Wholesale								
5 lb Canadian	78.0	79.5	79.5	59.5	+34	78.4	59.2	+32
Retail[4]	120.8	124.2	128.7	104.0	+24	121.8	103.1	+18
OCEAN PERCH:								
Ex-vessel[1]	7.2	7.6	7.5	5.3	+42	7.3	5.3	+38
Wholesale								
5 lb domestic	60.8	61.5	63.0	40.5	+86	59.5	36.9	+61
5 lb Canadian	53.6	54.3	55.4	40.2	+38	53.0	37.3	+42
Retail[4]	91.8	94.1	96.9	73.3	+32	92.2	73.2	+26

[1] Quotes taken at Boston, Mass.
[2] New York Consumer Market Reports.
[3] New Bedford, Mass.
[4] Bureau of Labor Statistics — average of 36 U.S. cities.
NOTE: All wholesale prices — f.o.b. Boston, Gloucester, and New Bedford.

May, however, was still above that in 1972.

With the decline in landings and imports and the increase in consumption, inventories have been drawn down rapidly. May 31 holdings were below the previous year for the first time this year and have been reduced about 40 percent from the record quantity in storage on January 1.

Table 7.—Blocks and slabs, supplies, May 1973.

	MAR	APR	MAY	MAY	Percent Change	JAN -	MAY	Percent Change
	1973	1973	1973	1972		1973	1972	
	Million Pounds				*Percent*	*Million Pounds*		*Percent*
Beginning Inventory	47.8	40.4	32.6	51.8	− 37	75.8	62.7	+ 21
Production	0.4	0.4	0.4	0.1	+300	2.0	0.7	+186
Imports	30.1	18.7	29.8	34.6	− 14	112.5	148.9	− 24
Total Supply	78.3	59.5	62.8	86.5	− 27	190.3	212.3	− 10
Ending Inventory	40.4	32.6	32.3	61.4	− 47	32.3	61.4	− 47
Consumption	37.9	26.9	30.5	25.1	+ 22	158.0	150.9	+ 5

Table 8.—Blocks and slabs, prices, May 1973. Wholesale prices of blocks f.o.b. primary wholesaler — Boston, Gloucester, and New Bedford, Mass.

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
		Cents Per Pound											
Cod	1972	46.5	47.0	47.0	47.0	45.6	46.5	47.0	47.0	47.0	47.0	47.0	48.0
	1973	48.6	52.4	56.6	58.5	61.1							
Flounder	1972	43.5	44.4	45.3	49.2	51.7	53.3	55.1	57.0	58.0	58.0	58.7	59.5
	1973	59.5	59.6	60.0	60.0	60.0							
Haddock	1972	47.1	47.5	47.5	47.9	50.3	52.8	54.4	57.0	58.1	59.5	59.5	59.5
	1973	60.1	60.5	61.4	63.3	64.9							
Ocean Perch	1972	38.5	38.5	38.7	39.5	39.5	39.8	41.6	45.0	48.0	48.3	49.4	49.0
	1973	51.2	53.1	53.9	54.0	54.8							
Pollock	1972	32.3	32.0	32.0	32.1	31.2	31.5	31.5	31.0	29.6	29.5	28.3	28.0
	1973	29.0	30.1	33.0	34.0	35.2							
Whiting	1972	33.0	33.5	33.0	33.0	33.2	31.5	31.5	31.5	31.5	32.0	34.1	34.0
	1973	34.6	35.8	37.5	37.5	37.5							
Wolffish	1972	49.3	50.0	50.0	50.0	50.3	50.5	51.0	51.5	51.3	51.0	51.0	51.0
	1973	51.0	50.0	54.5	52.0	52.0							

Table 9.—Sticks and Portions, supplies, May 1973

	MAY	MAY	Percent Change	JAN-MAY	JAN-MAY	Percent Change
	1973	1972		1973	1972	
	Million Pounds		*Percent*	*Million Pounds*		*Percent*
Beginning Inventory	24.4	16.1	+52	34.4	23.2	+48
Production:						
Sticks		7.8			50.9	
Portions		25.1			113.7	
Total		32.9			164.6	
Imports					0.6	
Ending Inventory	27.5	20.3	+35	27.5	20.3	+35

Table 10.—Sticks and portions, weekly average wholesale prices, May 1973.

Item	MAY	MAY	Percent Change	JAN-MAY	JAN-MAY	Percent Change
	1973	1972		1973	1972	
	Cents Per Pound					
Cod portions	67.0	60.5	+11	64.5	58.2	+11
Haddock	69.5	65.0	+ 7	69.2	63.1	+10
Cod sticks	78.0	77.0	+ 1	78.0	74.3	+ 5
Haddock sticks	80.0	79.2	+ 1	80.0	76.5	+ 5

SCALLOPS

Scallops continued to exhibit an improving supply position (Table 13) as the quantity available for consumption was 64 percent above the previous year in May, and 50 percent higher than the 1972 January-May total. Higher imports more than offset a slight decline in landings. Although the May east coast catch was above the previous year, production in Alaska was off sharply (54 percent during January-May). High Canadian landings and inventories, and resultant lower prices, have apparently encouraged increased shipments to the United States, as imports from Canada continue to be heavy.

Increased supplies have caused domestic prices to drop sharply (Table 14). The average ex-vessel price, for example, fell to its lowest level since July 1971, during March, and continued to decline through May (24 percent below May 1972). Although wholesale prices were also below the previous year, retail prices have remained higher. Consumption, however, remained well above the quantity consumed in 1972.

AMERICAN LOBSTERS

The supply situation for American lobsters (Table 15) has greatly improved this year as both landings and imports were up sharply. This improvement reflects the milder weather prevalent this year, as opposed to 1972, when an extremely harsh winter resulted in very low supplies during the first half of the year. As supplies have increased, prices on all levels have been well below those in 1972 (Table 16).

SPINY LOBSTER TAILS

Lobster tail supplies (Table 17) continue to be short this year as May imports were again below the previous year. Strong demand in recent months and lower imports have apparently

caused a 22 percent reduction in the quantity in storage since the start of the year. Prices have reacted to this situation by posting significant gains throughout the year (Table 18). While wholesale prices for warm-water tails were somewhat below the previous year, cold-water tail prices were at record levels and had passed the $5 mark for 4- to 6-ounce tails. In spite of these relatively high prices, consumption was 14 percent above May, 1972.

Table 11.—Shrimp supplies, May 1973.

	MAR	APR	MAY	MAY	Percent Change	JAN-MAY	JAN-APR	Percent Change
	1973	1973	1973	1972		1973	1972	
	Million Pounds				*Percent*	*Million Pounds*		*Percent*
Beginning Inventory	79.2	69.2	58.6	56.9	+ 3	92.7	69.9	+ 33
Landings:								
Total	12.7	7.8	14.4	19.3	− 25	59.1	59.4	− 1
Gulf	4.2	4.0	8.0	14.0	− 43	25.6	36.4	− 30
Northeast	3.1	.9	.7	.8	− 12	9.1	8.5	+ 7
Pacific	5.4	2.9	5.3	3.5	+ 51	23.6	12.8	+ 84
South Atlantic	—	—	.4	1.0	− 60	.8	1.7	− 53
Imports	16.3	17.0	16.4	25.1	− 35	84.9	95.5	− 11
Total Supply	108.2	94.0	89.4	101.3	− 12	236.7	224.8	+ 5
Ending Inventory	69.2	58.6	55.0	59.5	− 8	55.0	59.5	− 8
Exports:								
Total	6.6	4.4	4.6	3.1	+ 48	25.0	16.5	+ 52
Domestic Fresh & Frozen	4.9	2.8	3.1	2.5	+ 24	18.2	13.9	+ 31
Transshipments	1.7	1.6	1.5[1]	.6	+150	6.8	2.6	+162
Gulf Canned Pack	—	—	.3	4.6	− 93	1.2	5.4	− 88
Fresh & Frozen Consumption	32.4	31.0	29.5	34.1	− 13	155.5	143.4	+ 8

[1] Estimated

Table 12.—Shrimp prices, May 1973.

Item	MAR	APR	MAY	MAY	Percent Change
	1973	1973	1973	1972	
	Dollars Per Pound				
Ex-vessel:					
15-20 count	1.98	2.06	2.14	2.07	+ 3
31-35	1.76	1.81	1.84	1.40	+31
51-65	1.26	1.35	1.35	.95	+42
Wholesale:					
15-20 count	2.12	2.19	2.28	2.35	− 3
31-35	1.89	1.95	1.99	1.74	+14
51-65	1.32	1.51	1.54	1.08	+43
Retail:					
15-25 count	3.06	3.05	3.01	3.05	− 1
31-42	2.29	2.27	2.28	2.15	+ 6

Table 13.—Scallop supplies, May 1973.

	MAR	APR	MAY	MAY	Percent Change	JAN-MAY	JAN-MAY	Percent Change
	1973	1973	1973	1972		1973	1972	
	Thousand Pounds				*Percent*	*Thousand Pounds*		*Percent*
Beginning Inventory	3,418	2,869	2,714	946	+187	3,736	1,585	+136
Landings, Total	550	600	715	735	− 3	2,783	2,533	+ 10
Imports	1,995	1,370	2,175	1,735	+ 25	7,960	5,570	+ 43
Total Supply	5,963	4,839	5,604	3,416	+ 64	14,479	9,688	+ 50
Ending Inventory	2,869	2,714	3,083	1,026	+200	3,083	1,026	+200
Consumption	3,094	2,125	2,521	2,390	+ 6	11,396	8,662	+ 32

Table 14.—Scallop prices, May 1973.

Item	MAR	APR	MAY	MAY	Percent Change
	1973	1973	1973	1972	
	Dollars Per Pound				
Ex-vessel	1.96	1.76	1.44	1.90	−24
Wholesale	2.25	2.23	1.82	2.16	−16
Retail	3.19	3.23	3.08	2.64	+17

Table 15.—American Lobster supplies, May 1973.

	MAR	APR	MAY	MAY	Percent Change	JAN-MAY	JAN-MAY	Percent Change
	1973	1973	1973	1972		1973	1972	
	Thousand Pounds				*Percent*	*Thousand Pounds*		*Percent*
Maine Landings	149	317	1,280	754	+70	2,328	1,387	+68
Imports	1,606	1,493	3,517	1,998	+76	9,673	8,025	+20
Consumption	1,755	1,810	4,797	2,752	+74	12,001	9,412	+28

Table 16.—American Lobster prices, May 1973.

	MAR	APR	MAY	MAY	Percent Change
	1973	1973	1973	1972	
	Dollars Per Pound				
Ex-vessel	1.78	1.43	1.29	1.45	−11
Wholesale:					
2 lb.	3.10	2.83	1.92	2.09	− 8
1-½	2.88	2.55	1.87	2.06	− 9
1-¼	2.49	2.06	1.80	2.01	−10
1-⅛	2.47	2.00	1.77	2.01	−12
chix	2.42	1.99	1.76	1.97	−11

Table 17.—Spiny lobster tails, supplies, May 1973.

	MAR	APR	MAY	MAY	Percent Change	JAN-MAY	JAN-MAY	Percent Change
	1973	1973	1973	1972		1973	1972	
	Million Pounds				*Percent*	*Million Pounds*		*Percent*
Beginning Inventory	7.8	8.0	7.5	6.4	+17	8.9	4.7	+89
Imports	3.7	2.4	2.6	3.8	−32	14.8	18.0	−18
Total Supply	11.5	10.4	10.1	10.2	− 1	23.7	22.7	+ 4
Ending Inventory	8.0	7.5	6.9	7.4	− 7	6.9	7.4	− 7
Consumption	3.5	2.9	3.2	2.8	+14	16.8	15.3	+10

Table 18.—Spiny lobster tails, wholesale prices, May 1973.

Item	MAR	APR	MAY	MAY	Percent Change
	1973	1973	1973	1972	
	Dollars Per Pound				
6-8 oz. tail					
Cold-water	4.56	4.64	4.71	4.35	+8
Warm-water	3.30	3.33	3.65	4.00	−9

Timeliness; Prices; Headboats; Etc.

• One of the hazards of periodical publication is being overtaken by events. Things are happening pretty fast these days. Even the weekly newsmagazines, with all their brilliant methods of rapid publication and their large and alert staffs, are sometimes outdated before they reach the newsstands. Indeed, on occasion, the morning's newspaper appears to have no more than archival interest, events having piled up overnight with such tumultuous speed.

With *Marine Fisheries Review*, we can only reflect the situation prevailing about two and one-half months before you receive the magazine. In this month's number, for example, we carry an article by Joe Pileggi that is — as of late July — up to the minute and of considerable importance. The paper deals with how the current fuel shortage is affecting the fisheries. By the time you read the article, the fuel shortage may have gotten worse, or may have disappeared. In July's MFR, we printed a well-researched article by Irwin Penn on earnings in the fisheries. That article got into print before prices were frozen, making it immediately out of date. Mr. Penn was aware that drastic changes might be forthcoming and mentioned them in an Author's Note. Nevertheless, the article would have been a good deal more meaningful if damnable time had just stood still. It didn't: it won't: we know that, but at the risk of seeming to be as out of date as the crewcut, we will continue to try to present topics of current interest in MFR, trusting to luck that "current" will mean at least ten weeks.

• On this page of the March-April number of MFR I had an item dealing with the very high unit prices of some rather exotic fishery products—caviar, eel larvae, and pearls. In the May-June number, we carried Bill Folsom's article on the thriving eel fishery in Japan, citing a price of $417 per pound for elvers. Witold L. Klawe of the Inter-American Tropical Tuna Commission has brought to my attention a translation from the Japanese trade press that says that elvers brought 600,000 yen per kilogram on the black market in the spring. He was good enough to calculate this out for me: it comes to about $1,030 per pound.

Is there any other marine product—still excluding pearls—that reaches this staggering figure of over a million dollars a ton?

• On page 15, Chester Buchanan, in his good article on the effects of a fishing reef on the sport fishery and economics of a South Carolina town, has a footnote reading:

> A headboat is a vessel operated by a licensed captain which transports fishermen to fishing grounds daily for a fee per person on a first-come, first-served basis.

The footnote is the result of my puzzlement. On the first reading of the manuscript I came on the—to me—completely unintelligible term "headboat." A boat with "heads," in the naval sense, maybe? I didn't know and queried the author. He came up with the footnote quoted above.

No, I told him, that isn't right. That is an accurate description of what I would call a party boat.

On the west coast, sure, Chet replied (he's from California). But not in South Carolina. There, a party boat is a fishing vessel chartered for the day or longer by a single party of fishermen. Logical.

Yes, he knew that on the west coast that would be called charter boat. On the other hand, in South Carolina, it would not be.

Who says we all speak the same language? Or even that it's desirable? I am grateful to add another word to my vocabulary and a rather esoteric bit of information to the literature of fisheries.

• By now, all recipients of MFR should have received their copies of the Index to Volume 34 (1972). We regret the inconvenience the delay in issuing this publication has caused those librarians and others who bind their numbers of MFR in a single annual volume.

It is our intention to make this the last of the separately issued indexes for MFR. Beginning this year, we plan to include an author, title, and subject index in the December number. Thus, Volume 35 can be bound upon receipt of the December number. The practice of including an index in the final number of the year is one we are already following with the *Fishery Bulletin* and it seems to work out reasonably well.

• The initials "W.L.H." that conclude the account of the Seattle conference on page 2 of this number belong to Willis L. Hobart, a newcomer to the staff. A graduate of Oregon State University, he had two majors: wildlife management and journalism. He worked in Washington for a while and has published freelance articles in some of the national sports magazines. His photographs of wildlife have won prizes. In tying up with a fisheries organization, any man who would—as Hoby recently did—fondly describe his newborn son as being "about the size of a steelhead" must have found the right slot. You will be reading more of his work.

T.A.M.

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The EASTROPAC Atlases contain charts depicting the distribution of physical, chemical, and biological oceanographic properties and associated meteorological properties observed during EASTROPAC.

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Volume 1. Physical oceanographic and meteorological data from principal participating ships, first survey cruise, February-March 1967 (255 charts).

Volume 2. Biological and nutrient chemistry data from principal participating ships, first survey cruise, February-March 1967 (196 charts).

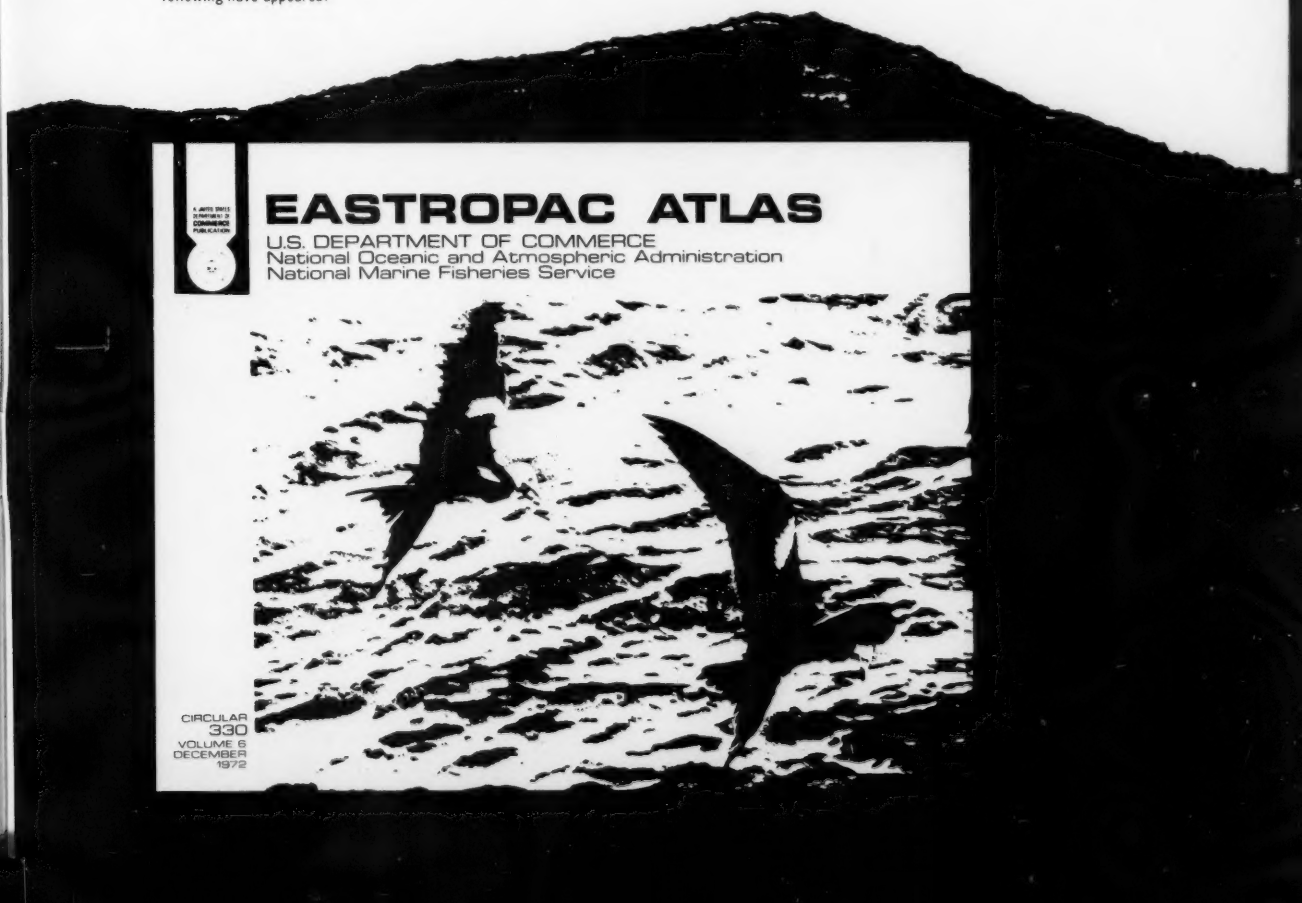
Volume 3. Physical oceanographic and meteorological data from principal participating ships, first and second monitor cruises, April-July 1967 (130 charts).

Volume 4. Biological and nutrient chemistry data from principal participating ships, first and second monitor cruises, April-July 1967 (165 charts).

Volume 5. Physical oceanographic and meteorological data from principal participating ships, second survey cruise, August-September 1967 (143 charts).

Volume 6. Biological and nutrient chemistry data from principal participating ships, second survey cruise, August-September 1967 (149 charts).

EASTROPAC Atlases are available from the Superintendent of Documents, U.S. Government Printing Office Washington, DC 20402 The price is $4.75 per volume.



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